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THE INDIGENOUS TANS AND VEGETABLE DYESTUFFS OF NEW ZEALAND.

PART I—*continued.*

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DYEING is the art of applying to a material another substance which results in the alteration of the colour of the material in such a way that it is more or less permanent under the conditions to which it is to be exposed. The essential difference between dyes and paints is that the latter do not penetrate below the surface of the material to be coloured. Dyes sink below the surface, and hence must be capable of entering the tissue of the material in solution.

Tans must also be capable of penetrating the substance to be treated, but they have the property of enabling the material to resist putrefaction. Hence the function of dyes is most largely ornamental, that of paints ornamental and protective, and that of tans used as such most largely preservative, although to some extent effecting a change of colour. A subsidiary use of tans is as mordants in fixing a dye in a form in which it cannot easily be removed from

the fabric treated. Tans can also be differentiated as a class by their astringent taste and chemical reactions, all giving black, green, or blue-black colours with iron salts.

MODERN EXPERIENCE AND RESEARCH IN NEW ZEALAND TANNINS AND DYES.

It will now be more convenient to adopt for the statements made a different arrangement, in which the sources of the tans and dye-stuffs are considered with some regard to their botanical relationship. That adopted is the order followed in Cheeseman's "Manual of the New Zealand Flora," which, although unhappily out of print, is the systematic work which is most readily available to the student.

Aristotelia racemosa (Makomako or Wineberry).—Colenso* (1868) suggests that the bark of this plant might be used for dyeing a blue-black.

Elaeocarpus dentatus (Hinau).—Skey† (1886) states, in a table containing the percentages of tannin in barks as received, analysed in the Colonial Laboratory and compiled for Messrs. Lightband and Co., and "which may be found useful to tanners," that the hinau-bark contained 19·12 per cent. of tannin. Kirk‡ (1889) states that the bark is of great value for tanning purposes, as it contains over 20 per cent. of tannin. Cheeseman§ (1906) states that the bark is still used by a few inland Maori tribes for dyeing flax cloths.

Elaeocarpus Hookerianus (Pokaka).—Skey† mentions 3·92 as the percentage of tannin in the bark. Kirk‡ states that the bark has been tested by Mr. Kingsland, of Invercargill, for tanning purposes and found to produce good firm leather. It contains 10 per cent. of tannin.

Coriaria ruscifolia (syn. *C. sarmentosa*) (Tutu or Tupakihi).—Lauder Lindsay‖ (1868) quotes Skey in the jurors' report of the New Zealand Exhibition, 1865, that tannin abounds in the leaf, root, calyx, seeds, flower-stalk, old wood, and pith of the plant, being in order of richness as follows: (1) young leaves, from 0·3 to 2·08 per cent.; (2) old shoots; (3) root; (4) old wood. The percentage is much higher in the dry than in the fresh state, varying from 2·14 to 8·32 in the former. There is no perceptible loss of tannin by drying the plant at 130–150° F., whence it is inferred that the small branches could

* Trans. N.Z. Inst., Vol. i, 2nd ed. † Twentieth Col. Laboratory Report.
‡ "Forest Flora of New Zealand." § "Manual of the New Zealand Flora."
‖ B. and F. Med. and Chir. Rev., "On the Properties and Products of the toot-plant of New Zealand."

be dried and stacked like oak-bark without losing any of the tanning properties. The plant is strongly recommended by Lindsay to the notice of the local tanners on account of its abundance. Kirk* states that the bark of *C. ruscifolia* contains 16·8 per cent. of tannin, and strongly recommends the use of the whole plant for this purpose. Skey† (1895) once, however, analysed a sample (6929) of bark forwarded by the Hon. Mr. Ward, and found only 6·6 per cent. of tannin in the material dried at 212° F.

The genus *Coriaria*, to which the tutu belongs, is a very widely spread one, consisting of closely allied species which are found in southern Europe, Central and South America, Japan, India, and New Zealand. The European *C. myrtifolia* is known as *Geberstrauch* (dyers' bush) in Germany, and as *redoul* in France. It has been used for dyeing and tanning, being then worth £9 10s. per ton. In Russia the root is largely used for tanning. Experiments upon the dyeing properties of *C. myrtifolia* carried out in the dyeing laboratory of the Yorkshire College, Leeds, have shown that the leaves of this species contain about 16 per cent. of tanning-matter. The colour of leather tanned with the extract was practically equal to that produced by sumach. The percentage of tanning-matter in sumach is, however, considerably higher than in the two species of *Coriaria*. *C. thymifolia* is in South America known as the "ink-plant," and the juice of the fleshy petals is used as ink under the name "chauchi." Jameson‡ (1863), writing from Quito, is quoted by Dr. Hooker that this ink is preferred to the commercial inks in use. It does not corrode the steel pen, and it is said to resist the action of sea-water. When newly written the colour is reddish, becoming black after a few hours. *Coriaria thymifolia* is one of the commonest hillside plants in many parts of New Zealand. From it Easterfield and Aston§ (1900) isolated a quantity of gallic acid and the dye quercitin ($C_{15}H_{10}O_7 2H_2O$), which is a glucoside, a lemon-yellow crystalline powder having marked dyeing properties. It has been found by A. G. Perkin‖ (1900) in *Coriaria myrtifolia*, and is widely distributed in the vegetable kingdom, occurring in berberry, onion-skin, Cape sumach, and Gambier catechu.

Ackama rosaefolia (Makamaka).—Colenso¶ suggests that it might be found useful in tanning. Kirk* states that the bark has been utilized for tanning, and is probably of similar value to that of the closely allied tawhero.

* "Forest Flora of New Zealand." † Twenty-ninth Col. Lab. Report.
‡ Proc. Linn. Soc. London, Vol. vii. § "Tutu," Pt. I, Eighth Report, Dept. Agriculture; Trans. N.Z. Inst., Vol. xxxiii; Trans. Chem. Soc. London, Vol. lxxix.
‖ Trans. Chem. Soc. London, Vol. lxxvii. ¶ Trans. N.Z. Inst., Vol. i, 2nd ed.

Weinmannia sylvicola (Tawhero or Towai).—Kirk* states that this tree has long been famous for its bark, which contains from 10 to 13 per cent. of tannin, and was formerly used to a large extent in the Auckland tanneries. The supply was, however, obtained in a most wasteful manner, the bark being peeled as high as a man could reach, the branches and upper portions being left untouched, so that the supply in the immediate vicinity of the settlements soon became exhausted. Cheeseman† also states that the bark is largely used in tanning.

Weinmannia racemosa (Towai or Tawhero in the North, Kamahi in the South Island).—This tree is closely allied to the preceding species, which only occurs in the North Island. Buchanan‡ (1868) states that the bark is valuable in tanning. Skey§ (1868) gives an analysis of extract of towai-bark furnished by Mr. Grayling, of Taranaki, as follows: Water, 21·5 per cent.; catechuic acid, 42·5 per cent.; tannic acid, 31·1 per cent.; lignin, 1·8 per cent.; gum and undetermined, 3·1 per cent. Kirk‖ (1886) states that Grayling was awarded a certificate of merit for this extract at the United States International Exhibition, Philadelphia, 1876–79. Kirk* states that the bark is of great value for tanning, as it contains 13 per cent. of tannin. He suggests that it might be made into an extract, as it can be obtained in vast quantities. Skey¶ (1899), reporting on sample 8049 of kamahi-bark from Rataville, Ratanui, reports that as received it contained 5·6 per cent. of tannin and 9·2 per cent. of extractive matter, and was much inferior to oak or wattle bark as a tanning-material. Mr. Kingsland** (1916), managing director of a large firm of tanners in the South Island, made an exhaustive trial of this and other native barks for years, but in the end discarded them altogether in favour of Australian and Tasmanian wattle, finding that even at a greater cost wattle was better and cheaper for their purpose. It is now thirty years since this firm manufactured any of these barks grown in New Zealand, and it has used only wattle-bark since. The tanning with native barks was slow compared with wattle; but one of the worst features of the native barks was the large proportion of dye and acid they contained—substances detrimental to the colour and appearance of the leather when manu-

* "Forest Flora of New Zealand." † "Manual of the New Zealand Flora." ‡ "Sketch of the Botany of Otago." Trans. N.Z. Inst., Vol. i. § Trans. N.Z. Inst., Vol. i, 2nd ed. ‖ "New Zealand Timbers, Bark, and Secondary Forest Products." Parliamentary Report by T. Kirk, Chief Conservator of State Forests. C.–3B. This report gives the analysis of a number of indigenous barks assayed for tannin in the Colonial Laboratory, and therefore by Skey. The discrepancy in the amount of tannin in the bark of the same tree by the same analyst may be due to the difference of the season of the year in which they were collected. ¶ Thirty-second Col. Lab. Report. ** Personal communication.

factured for sale to the boot-factories, although the durability of the leathers produced from these barks was very good, especially so for "sole" leather. Owing to the existence of the deleterious substances mentioned, "upper" leather manufactured from these barks suffered to some extent in appearance, &c.; and where fine, clear, bright-grained leathers were required—say, for saddlers' work in brown harness, leggings, and bridle-hide—it was out of the question to produce a satisfactory and saleable article. Mr. Kingsland, who has so kindly placed his valuable experience at the author's disposal, points out that chrome (mineral) tannage is largely replacing organic (vegetable) tannage, perhaps one-half of the leather now made in New Zealand being produced by the former method. He also points out that the climatic conditions for harvesting bark may not be suitable in wet districts of New Zealand, nor the lowland soil conditions so suitable for growing it. He hints that should some method be found of combating the injurious effects of the substances called by him "acids and dyes" in the New Zealand barks they may yet be found to be satisfactory. The Woolston Tanneries (Limited), of Christchurch* (1916), who pay some £13,000 per annum for imported wattle-bark and other extracts, came to the conclusion that kamahi-bark was the most suitable to experiment with in the attempt to utilize native barks in tanning. Another firm, who wish the source of their information kept confidential, express the opinion that owing to the small percentage of tannin in New Zealand barks there is no possibility of utilizing them unless concentrated to the form of an extract.

Tetragonia trigyna (New Zealand Spinach).—Colenso† states that on the Maoris learning to write they used the fluid of this plant, which yields a purple juice, for ink. The fruit of *Schefflera digitata* and the juice of the root of *Phormium* were also used by them for a similar purpose.

Metrosideros spp.—Skey‡ gives the tannin-content of "rata" as 15·2 per cent. Kirk§ states that the bark of *Metrosideros robusta* (rata) contains 18·56 per cent. of tannin.

Coprosma spp.—It is somewhat remarkable that the possibilities of the *Coprosma* genus, which is restricted in habitat to Australasia, Pacific islands, New Guinea, and Borneo, should not have been chemically examined as a source of dyes, seeing that the genus is included in the family Rubiaceae, which contains the madder of commerce. Of all the New Zealand plants, theory would point to this

* Personal communication. † Trans. N.Z. Inst., Vol. i, 2nd ed. ‡ Twentieth Col. Lab. Report. § "Forest Flora of New Zealand."

genus as the one most likely to realize economic expectations in the matter of dyestuffs, owing to its relationship to the madder, its abundance, size, and the coloured inner bark of some of the species. The madder-plant (*Rubia tinctorum*), according to Pliny, was used in the ancient civilizations. Some authorities assert that it was used in dyeing long before it was employed in painting. Its cultivation was much encouraged in the reign of Charlemagne, but it met with varying fortunes in Europe until the first half of the nineteenth century, when in France under Louis Philippe its culture was increased in consequence of its use in dyeing military material. This prosperity continued until the synthesis (artificial manufacture) of alizarin, the chief dye in madder, was accomplished in 1869. This discovery by chemists in Germany was patented in England on the 25th June, 1869. On the following day Perkin applied for a provisional patent which he had discovered independently. The two investigators then collaborated with the Badische Anilin und Soda-fabrik. This was the first natural vegetable dyestuff to be artificially produced, and it and its derivatives now rival those of indigo in importance. The yellow root of madder, which becomes red on drying, contains a much larger proportion of the colour-making substances than other parts of the plant, a fact which bids fair to find a parallel in the case of the coprosmas, judging by the increased thickness and colour of the root-bark compared with the above-ground parts. It is to be noted that the artificial dyestuff has almost entirely replaced the natural madder-root except for dyeing military material and making fine pigments. The present author, finding that the bark of certain New Zealand species of *Coprosma* yielded with alkalis a brilliant purple-red solution, looked into the matter. Although the bark of *Coprosma grandifolia* was examined for alkaloids with a negative result by Skey† (1869), and he noted that the inner surface of the bark was a bright-yellow colour, the chemical examination of the colouring-matters of this species and the genus generally does not seem to have received the attention which its close relationship to the madder-plant (*Rubia tinctorum*) of commerce would warrant.

There are at least three New Zealand species of the genus *Coprosma** —representatives of which are among the commonest and most widely distributed native shrubs—the bark of which (especially that of the root) is of considerable tinctorial power—viz., *Coprosma grandifolia*, *C. linariifolia*, and *C. areolata*. The first has an orange-yellow, the

* Since writing the above I have ascertained that additional species give a colour reaction with alkalies—viz., *C. lucida C. rotundifolia, C. rhamnoides, C. foetidissima*, and *C. microcarpa*. † "On the Examination of the Bark of *Coprosma grandifolia* for Alkaloids." Trans. N.Z. Inst., Vol. ii.

second a bright-yellow, and the third a deep-brown inner bark. The colour is more deep the nearer it is to the root, and less deep towards the ends of the branches. The Maoris are said to have used both *Coprosma grandifolia* and *C. robusta* or *C. lucida* for producing shades of yellow in their phormium cloths, but the author can find no reference to a red or a blue dye obtained by the Natives from these plants.

Extracts from *Coprosma grandifolia* dye cotton a delicate pink or red, and wool shades of purple, and the brown inner bark of *C. areolata* stains the hands a persistent brown. The following experiment seems to show that both alizarin and purpurin or nearly allied compounds are present in the bark of *C. grandifolia*. Seventy-two grams of the fresh bark of *C. grandifolia* from the above-ground portions of the plant gathered in August were allowed to lie for forty-eight hours, and were then steeped in water for twenty-four hours and the water separated. The bark was then steeped in alcohol for twenty-four hours and the alcohol removed by distillation. A small portion of the alcoholic extract gave on mixing with caustic soda (10-per-cent. solution) a brilliant purple coloration, becoming yellow with dilute hydrochloric acid. The acid alcoholic extract was shaken with ether six times, which removed all the colouring-matter. On evaporating the ether a crust of orange-coloured crystals was deposited: these under the microscope were seen to consist of a mixture of bright-red and yellowish clumps of acicular crystals. After drying in a desiccator over sulphuric acid the weight was 0·05 gram (= 0·068 per cent. of the wet bark). These crystals, which sublimed on the walls of a test-tube immersed in hot sulphuric acid, by the action of a boiling saturated solution of potash alum were separated into a yellowish-red fluorescent solution and a brown insoluble substance which gave an intense purple coloration with alkalis. Tannic acid did not precipitate the colouring-matter from either the acid or alkaline solution.

The present desire to utilize New Zealand vegetable dyes in connection with the home spinning of woollen goods and the dyeing of military material, and the abundance of the forty New Zealand species of *Coprosma* and the large size of their roots compared with madder-roots used in commerce, have suggested to the author that the economic as well as the scientific aspect should be investigated. Preliminary tests show that there is reason to believe that closely similar if not identical dyes to those of madder are to be obtained from *Coprosma*, and the matter is accordingly being made the subject of research.

Eugenia maire (Whakou or Whawhakou or "Riwaka").—Kirk* (1886) states that the bark contains 16·7 per cent. of tannin. Blockley† (1902) found in *E. Smithii*, the New South Wales "Lillypilly," 10·7 per cent. of tannin.

Fuchsia excorticata (Kotukutuku).—Buchanan‡ notes that the wood is astringent, forming shades of purple to black with iron. Kirk§ states that the wood contains 5·3 per cent. of tannin, according to an analysis made in the Colonial Museum.

Vitex lucens (syn. *V. littoralis*) (Puriri).—A. G. Perkin‖ (1898), working in the Clothworkers' Research Laboratory of the Yorkshire College Dyeing Department, isolated and studied two yellow dyestuffs from puriri wood obtained from Auckland, which he named vitexin and homovitexin. He reports on the dyeing properties of the wood as follows:—

In studying the dyeing properties of this material, woollen cloth mordanted with aluminium, iron, chromium, and tin was employed. The results are embodied in the table below, in which have also been placed for comparison the shades given by old fustic (*Morus tinctoria*) and weld (*Reseda luteola*), for these among the commercial natural dyestuffs most nearly approximate in shade to the *Vitex littoralis*. The most striking property of this dyestuff is the very yellow tones it produces with chromium and aluminium mordants, these being free from any admixture of red, and possess, if anything, a faint greenish tint. Exposed to light for three months, the chromium and iron mordanted patterns showed no great alteration, whereas the aluminium and tin shades had very perceptibly faded. The results with mordanted calico were similar, although the colours thus obtained had a slightly brighter character. Three samples of the wood were examined, with the result that there was some variation in colour-strength; the sample last received was the strongest, and this was employed for the above dyeing experiments. On account of the pure-yellow tones it produces, some hope exists that, where these are necessary, this dyestuff may be of some commercial utility for this purpose. A well-known Leeds firm who have examined a sample consider that it should have a limited sale at £4 per ton, a value somewhat below that of old fustic, which is at present £4 10s. During the examination of apigenin and vitexin it has been shown that these colouring-matters are not perceptibly oxidized on passing air through their alkaline solutions, and it seemed of interest to ascertain if this property was in any way connected with their behaviour on exposure to light. Experiments, however, seem to negative this view, for the shades given by aluminium and tin mordants are not fast, and those with chromium and iron possess no great

* "New Zealand Timbers, Bark, and Secondary Forest Products." Parliamentary Report by T. Kirk, Chief Conservator of State Forests. C.–3B. † Jour. Soc. Chem. Industry, Feb., 1902. ‡ "Sketch of the Botany of Otago." Trans. N.Z. Inst., Vol. i. § "Forest Flora of New Zealand." ‖ "Colouring-matter of the New Zealand Dyewood Puriri (*Vitex littoralis*)," Pt. I. Trans. Chem. Soc. London, Vol. lxxiii.

superiority over those obtained from colouring-matters which suffer decomposition when oxidized in a similar manner.

—	Chromium.	Aluminium.	Tin.	Iron.
Vitex littoralis	Dull yellow, slight green tint	Dull yellow, slightly pale	Pale lemon-yellow	Dull grey-brown.
Weld ..	Full brown-yellow	Bright yellow ..	Pale yellow	Deep brown-olive.
Old fustic	,,	Yellow olive ..	,,	Ditto.

Barger* (1906) has subsequently found vitexin in the products of the hydrolysis of saponarin from *Saponaria officinalis*, and with Perkin's collaboration compared the tinctorial properties of vitexin from both sources. Barger also studied the constitution of vitexin, which he says seems to belong to a new class of colouring-matters closely allied to the flavone group. The present economic importance of the puriri is that it has been suggested by Professor Easterfield, of Wellington, as a source of khaki dye for military material, in place of old fustic.

Avicennia officinalis (New Zealand Mangrove).—Mr. E. Phillips Turner, of Wellington, sent the author 10 lb. of the bark of this tree in November, 1915, but no trace of tannin could be found, a result which was in accordance with its lack of astringent taste. The author consulted Sir D. Prain (Kew), Mr. Maiden (Sydney), and Mr. Baker (Technological Museum, Sydney) regarding this somewhat remarkable absence of tannin, considering the statements which have been made regarding the tannin-content of *Avicennia*, and even of *A. officinalis* in other countries. Baker† (1915), who gives a list of these references, finds that the bark on the Australian plant is so thin, the quantity of bark and the percentage of tannin so small, that it would never pay to use it for tanning purposes. All three of these authorities suggest that there is considerable confusion in the references to mangroves in literature, and one suggests that the New Zealand plant may yet have to be classified under a name distinct from *A. officinalis*. *Avicennia africana*‡ from Southern Nigeria has been found to contain from 12·5 to 19·8 per cent. of tannin. No mention of *Avicennia* as a source of tannin is made by such authorities as Allen§ (1901), Thorpe‖ (1913), or Philippine Islands workers¶ (1911), who, however, mention other genera of mangroves as being

* Saponarin: a new glucoside coloured blue with iodine. Trans. Chem. Soc. London, Vol. lxxxix. † "The Australian Grey Mangrove, *Avicennia officinalis*." Proc. Roy. Soc. N.S.W., Vol. xlix. ‡ Bull. Imp. Inst., 1913. § "Commercial Organic Analysis," Vol. iii, Pt. I. ‖ "Dictionary of Applied Chemistry," Vol. v. ¶ "Economic Possibilities of the Mangrove Swamps of the Philippine Islands." P.I. Journ. Science, Vol. vi.

valuable tannin sources—viz., *Rhizophora, Ceriops, Bruguiera, Xylocarpus, Kandelia,* and *Sonneratia.*

Fagus (syn. *Nothofagus*) (Beech, or "Birch" of the Settler).—A great deal of confusion exists in the popular naming of this genus, the species of which are all large forest-trees, and have, according to Cheeseman* and Kirk,† the following settlers' names: *Fagus Menziesii* is tawhai, tawai, white, silver, brown, or red birch; *F. fusca* is tawai, tawai-raunui, black-birch, bull-birch, or red-birch; *F. Solandri* is tawhai, tawhai-rauriki, black, red, or brown birch; *F. clifortioides* is tawhai-rauriki, black, white, or mountain birch. Kirk (1886) states that a Mr. Godsif, or Goodhue, of Havelock, recently produced from *F. fusca* (the bark of which is used for tanning) by a simple method a tannin-extract which contained 22·51 per cent. of tannin. Skey‡ states that the bark of the "black-birch" (1872) contained 6·9 per cent., the red-birch (March, 1885) 6·1 per cent., the black-birch (March, 1885) 6·2 per cent., and the brown-birch 7·02 per cent. of tannin. Kirk quotes the red-birch as containing 7·6 per cent. of tannin.

Mr. Kingsland§ states he found from experience that a birch-bark produced from the Nelson District of New Zealand, and put on the market by a Mr. Lightband, contained the highest percentage of tannin of any New Zealand barks he had ground. Mr. C. C. Empson, Stock Inspector at Nelson, kindly made inquiry and reported that the Mr. Lightband referred to did at one time carry on a business at Wakefield, crushing birch-bark for tanning purposes, using mostly brown-birch bark, but the venture was not a success financially. Mr. Greenslade, tanner, of Nelson, claims that with one exception he is the only tanner who has stuck to birch-bark, which he has been using for many years—principally brown-birch, but he mixes black-birch with it. The latter is not so easily obtained, and is much lighter than the brown-birch bark, but the mixed bark makes good tan. Birch-bark, Mr. Greenslade claims, is as good as the English oak-bark and just as slow, but makes the very best quality of leather. Four tons of mixed birch-bark are equal to 1 ton of wattle-bark, but the wattle-bark can be used a second time. This tans in half the time that birch-bark does. The cost of obtaining the birch-bark is now becoming prohibitive, and taken altogether the wattle is cheaper. Birch-bark which formerly cost £2 now costs £3, whereas wattle costs £9; mixed birch-bark gives a tan liquor of 12° density, whereas wattle gives 33°. Leather tanned by wattle is inferior in quality to that tanned by birch tan.

* "Manual of the New Zealand Flora." † "Forest Flora of New Zealand."
‡ Twentieth Col. Lab. Report. § Personal communication.

Podocarpus spicata (Matai or Black-pine).—Kirk states that the bark is occasionally used by the tanners, but only to a small extent.

Dacrydium cupressinum (Red-pine or Rimu).—Skey* (1886) states that rimu-bark as received contained 3·8 per cent. of tannin. Kirk† states that rimu-bark is often used by the tanner, and is valued for certain qualities of leather, although it imparts a red colour to the skin. Its percentage of tannin is low, being only 4·3 per cent., and he suggests that an extract should be made.

Phyllocladus trichomanoides (Celery-topped Pine, Tanekaha, Toatoa).—This is a rather rare tree, of which one hears nothing but good both from the arboriculturist, the timber expert, and the bark-merchant. Of great beauty as a young tree, it is of very quick growth, under favourable conditions making about 2 ft. a year in height. The following account of its value suggests to the author that experiments might be made in planting this tree artificially, or at all events some consideration might be given to the matter. Skey‡ (1883) reports as follows:—

No. 3399 is the bark of the tanekaha. It is exported to Germany in considerable quantity as a dyeing-material by Messrs. Krull and Co., who were anxious to know something of its chemical nature, and to make public such knowledge for industrial purposes. The following is the report furnished to this firm: This bark contains 25·30 per cent. of tanning-material in the state in which it was received. In this state it contained 11·33 per cent. of water. The amount of tanning-material, therefore, upon the dry bark is 28·66 per cent. This material is principally catechuic and allied acids, tannic acid forming the remainder. The dyeing property of the bark is to be referred to this acid (the catechuic) and its allies. This substance is of considerable value in commerce, being, as Dr. Muspratt states, "used for compound colours as black, green, brown, drab, and fawn," and is, he further states, in "high estimation on account of its permanency." In practice I find the extract of this bark in hot water gives reddish and pink-coloured compounds with zinc, tin, and alumina; and these seem durable, being very insoluble in water, and unchanged in the air or light.

Kirk† states that the bark contains 23 to 28 per cent. of tannin, and is therefore highly valued by the tanner. It possesses a special value as an organic mordant in the preparation of basils for kid gloves, and has realized from £30 to £50 per ton in London for this purpose; but the demand is intermittent, as it is dependent on the caprice of fashion with regard to particular shades of colour. Skey§ (1885) reported on another sample of reputed tanekaha-bark from Nelson (No. 3638), which contained 24·34 per cent. of tannic and catechuic acids soluble in water and precipitable therefrom by gelatine.

* Twentieth Col. Lab. Report. † "Forest Flora of New Zealand."
‡ Eighteenth Col. Lab. Report. § Nineteenth Col. Lab. Report.

Phyllocladus glauca (Toatoa) and *P. alpinus* (Mountain Toatoa).—Kirk* suggests that the phyllodia (false leaves) of these two species probably contain large amounts of tannin, and in all probability the bark would prove of equal value to that of *P. trichomanoides* for tanning.

Liliaceous Plants.—Among these Colenso† (1868) mentions that the root of the *Phormium* was used by the Maoris to produce an ink. Skey‡ mentions the toi-bark as containing a large proportion of tannin. He may mean toii (*Cordyline indivisa*) or giant cabbage-tree.

Lichens.—With regard to the dyes extracted in Europe from lichens, Edge§ (1914) states that from cudbear were formerly made dyes in considerable quantity in Scotland, generally by the aid of ammonia and air, on *Lecanora tartarea* and *Urceolaria calcaria*. *Evernia prunastri*, *Umbilicaria vellea*, *U. pustulata*, *Parmelia perlata*, *Lecanora pallescens*, and some other lichens of less commercial value also give a purple colour by this method. The dyestuffs made by these British lichens are not equal to that of Roccellae (orchil of Sweden). In the case of the crottles, which are still largely used for dyeing browns in the homespuns of Harris, Lewis, Donegal, Shetland, &c., the dyestuff appears to be ready formed in the plant, and to be obtained by simple extraction. The best known are *Parmelia saxatelis* or black-crottle and *P. omphalodes*, while others are *P. caperata* or stone-crottle, *P. ceratophylla* or dark-crottle, *P. parietina*, and a few species of *Sticta*, especially *S. pulmonaria* or hazel-crottle. These lichens undergo no preparation, being gathered in July or August, when they are richest in colouring-matter, and simply dried in the sun. They dye without addition to the bath, and do not form lakes. Fine shades of brown are obtained fast to acids and alkalis, but less fast to light than a mixture of metachrome brown B and metachrome orange 3R, although in fading an agreeable tone is maintained. Hooker‖ (1867) states that *Parmelia caperata* occurs on trees in the North and Middle Islands of New Zealand; *P. saxatelis*, North and Middle Islands, on trap rocks, Otago; *P. parietina*, North and Middle Islands, common rock, wood, and bones; *P. perlata*, common on trees, North and Middle Islands; *Lecanora tartarea*, probably common throughout both Islands. The genera *Sticta* and *Umbilicaria* occur in New Zealand, but not the above species.

* "New Zealand Timbers, Bark, and Secondary Forest Products." Parliamentary Report by T. Kirk, Chief Conservator of State Forests. C.–3B.
† Trans. N.Z. Inst., Vol. i, 2nd ed. ‡ Twenty-ninth Col. Lab. Report.
§ Journ. Soc. Dyers and Colourists, Vol. 30. Abst. in J.S.C., Vol. 33, 1914.
‖ "Handbook of New Zealand Flora."

CERTIFICATE-OF-RECORD TESTING.

THE LATEST LIST OF COWS.

W. M. SINGLETON, Assistant Director, Dairy Division.

THE testing of purebred cows for production of milk and butter-fat is manifestly increasing greatly in popularity. The entries for the new season's operations considerably exceed those of the previous year, and the testing staff will be hard pushed in the next month or so to cover the work, notwithstanding the recent appointment of an additional man. The testing movement obtains to a greater extent in the Wellington, Taranaki, and Waikato districts, and is doubtless a most praiseworthy effort in the direction of increased efficiency in the production of butter-fat. General conditions, including shortage of labour, have restrained many breeders and dairymen from testing the production of their individual cows, but the importance of selecting the best strains was never greater, and testing is necessary to this end. The conservation of the best strains is more important than culling the inferior, if the two phases of herd-improvement can be considered separately.

Appended to these notes is a list of records completed since New Year, the last list, published in the *Journal* of February last, having given particulars up to the 31st December, 1916.

JERSEYS.

The list of Jerseys discloses no new class-leaders, although one-half of the number have produced more than 100 lb. butter-fat above the requirement for certificate, and two of these increased the margin to 205 lb. fat and 219 lb. fat respectively.

In the two-year-old class Belmont's Wonder has a credit of the 205 lb. fat referred to, over her requirement. This heifer's dam is Nukumaru Primrose I, a daughter of K.C.B., with a certificate of record for 547·82 lb. fat. The dam of Nukumaru Primrose I is a daughter of Stuckey's Silver King, from a daughter of Monopoly II. The sire of Belmont's Wonder is a son of K.C.B., from Michaelmas Day, with a certificate of record for 480·87 lb. fat. It would appear

that these progenitors have not only been able to produce but to transmit factors for production as well.

Lady Ray, in the mature class, has a ceredit of almost 220 lb. fat above her requirement, in 351 days. Through her sire she is a descendant of the old Beauty family of Mr. Day's. Her grandsire, Pride of Egmont, was used by Mr. J. G. Harkness at Tariki, and five of this bull's daughters have qualified for certificates of record.

The next in order of merit in the mature class is Roses Sweet, a double granddaughter of K.C.B. and granddam of Lady of Collingwood. This is a third record for Roses Sweet, and although it raises her original record by some 65 lb. fat, we understand even this does not do her justice, as she met with an accident during the testing-period.

Eminent's Lenora, a daughter of Eminent's Fontaine, adds another to this sire's number of 500-lb.-butter-fat daughters. She is from a high-record inbred daughter of Duke of York.

Titanite has the distinction of being the only Jersey in this list to reach the 11,000 lb. milk. She also adds another to the 500 lb. butter-fat list of the breed.

FRIESIANS.

In this list the Friesians have two new class-leaders. Burkeyje Sylvia Posch, in the junior four-year-olds, with 679·86 lb. fat, supersedes Meta, whose production was 675·06 lb. fat. This record represents the third successive high production for Burkeyje Sylvia Posch. She has been milking continuously since her first calving, and is now on test for her fourth consecutive year. She is reported to be in excellent form, and during the latter days of August has been exceeding 80 lb. milk daily. She is a Canadian-bred cow, and comes from strains of heavy producers. Her three records are,—

Age at Start of Test.	Days in Milk.	Milk.	Fat.
Years Days.		lb.	lb.
1 350	365	16,646·3	505·27
3 30	365	19,024·7	610·42
4 69	365	20,016·7	679·86

From 25th March, 1914, to 17th June, 1917, this cow produced 55,687·7 lb. milk, containing 1,795·55 lb. fat, which represents an average production in 365 days of 18,562·6 lb. milk, containing 598·52 lb. fat. She dropped three calves during this period, and a fourth calf six weeks after finishing the last record. In Canada, a

half-sister to Burkeyje Sylvia Posch has produced world's milk records for periods from one to thirty days, attaining 152·1 lb. milk in twenty-four hours, and 44·1 lb. at one milking after six hours from her preceding milking.

In the junior two-year-old class Friesland Park Butter Girl displaces Lady of Cliffside II as leader by a margin of 18 lb. fat. The two grandsires of this heifer are King Segis Wild Rose Homestead and Cliffside Laddie. Both these bulls have sired a number of high-record daughters, and it was only to be expected that this heifer should produce well.

WOODCREST PIETJE KATE.

In the mature class there are three 500 lb. butter-fat records. Tui de Kol has raised her previous record by 36 lb. fat. Kaitangata Dinah is from the same dam as her sire, and still has the staying-power, at eleven years of age, to produce 525·87 lb. fat.

Woodcrest Pietje Kate is an imported cow whose sire and dam were both sired by Homestead Girl de Kol's Sarcastic Lad. She had an unfavourable start at the beginning of her test, and the record does not altogether do her justice. The illustration of this cow is from a photograph taken shortly after she was milked. She comes from strains representing not only world's records on production (at the time), but winners in show-rings with strong competition.

LIST OF RECORDS FROM 1ST JANUARY, 1917.

Name of Cow and Class.	Name and Address of Owner.	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS.				
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Belmont's Wonder ..	H. Stratford, Shannon	1 351	240·5	365	7,515·90	445·83
Una's Flora ..	J. G. Harkness, Wellington	1 339	240·5	362	6,206·30	383·00
Miro Meadows Princess	A. A. Ward, Tariki ..	2 48	245·3	300	6,011·60	332·37
Bonny Bell ..	Clague Bros., Manaia	1 284	240·5	326	6,440·70	316·75
Petune's Ivy ..	Roulston Bros., Pukekohe	1 326	240·5	293	5,348·60	244·15
Senior Two-year-old.						
Grannie's Viola ..	Roulston Bros., Pukekohe	2 227	263·2	288	6,095·60	341·05
Junior Three-year-old.						
Whenuku Lathyrus..	C. Goodson, Hawera..	3 10	278·0	301	6,120·70	327·62
Erin's Lone Star ..	E. O'Sullivan, Cardiff	3 22	279·2	192	5,368·40	296·05
Senior Three-year-old.						
Dominion May ..	F. Adam, Hoanga, Dargaville	3 284	305·4	346	7,058·80	421·31
Junior Four-year-old.						
Golden Primrose ..	H. L. Spence, New Plymouth	4 130	327·5	365	8,497·70	431·66
Molina's Redwing ..	F. E. Hellyer, Dunedin	4 16	315·1	299	6,957·50	390·67
Mature.						
Lady Ray ..	Clague Bros., Manaia	5 274	350·0	351	9,320·40	569·71
Roses Sweet ..	F. E. Hellyer, Dunedin	8 276	350·0	365	10,001·30	537·95
Eminent's Lenora ..	C. G. C. Dermer, Waipiko	5 333	350·0	349	8,906·80	518·59
Titanite	R. F. Wilkinson, Pukekohe	9 270	350·0	338	11,177·10	513·88
Scarlet Pimpernel ..	C. G. C. Dermer, Waipiko	9 71	350·0	340	10,024·40	491·52
Hazeline	W. J. Hall, Matatoke	7 196	350·0	291	7,466·30	454·76
Dominion's Pride ..	Ruakura Farm of Instruction, Hamilton	5 240	350·0	315	7,571·40	433·16
Flora II	J. G. Harkness, Wellington	14–15 years	350·0	323	6,303·80	381·96
Brown Eyes ..	Mrs. R. F. Wilkinson, Pukekohe	6 176	350·0	328	7,069·90	354·81
		FRIESIANS.				
Junior Two-year-old.						
Friesland Park Butter Girl	W. McLachlan, Doyleston	2 131	253·6	365	13,966·20	553·21
Lady Bountiful ..	H. Johnson, Stratford	1 241	240·5	365	8,072·00	257·45
Senior Two-year-old.						
Westmere Netherland Princess IV's Daughter	John Donald, Westmere	2 189	259·4	362	11,283·40	403·79
Clover Corona de Kol	J. H. Parkinson, Opotiki	2 345	275·0	326	10,049·00	314·07
Junior Three-year-old.						
Friesland Lulu ..	W. I. Lovelock, Palmerston North	3 82	285·2	365	8,750·10	292·94

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Name and Address of Owner.	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	FRIESIANS—*continued.*					
Junior Four-year-old.		Yrs. dys.	lb.		lb.	lb.
Burkeyje Sylvia Posch	H. North and Sons, Omimi, Dunedin	4 69	320·4	365	20,016·70	679·86
Aaggie Colantha Hengerveld Belle	W. I. Lovelock, Palmerston North	4 40	317·5	365	13,126·20	440·10
Princess Van Cleve II	Ditto	4 124	325·9	365	13,061·90	410·23
Senior Four-year-old.						
Woodcrest Netherland Colantha	Cluny Friesian Farm Company, Wellington	4 309	343·4	305	13,987·40	464·44
Mature.						
Tui de Kol ..	George Aitchison, Kaitangata	6 169	350·0	365	18,008·75	595·79
Kaitangata Dinah ..	Ditto	11 91	350·0	322	12,679·25	525·87
Woodcrest Pietje Kate	Cluny Friesian Farm Company, Wellington	5 145	350·0	365	14,301·00	512·67
Patience of Brundee	H. E. Johnson, Tokaora	7 281	350·0	333	13,085·50	450·76
Princess Belle Wayne	C. C. Buckland, Cambridge	5 250	350·0	365	14,025·10	417·26
Manor de Kol ..	W. I. Lovelock, Palmerston North	9 99	350·0	359	12,921·90	389·25
	SHORTHORNS.					
Rata	J. T. Singer, Waikanae	3 288	305·8	332	8,650·00	316·34
Te Marama's Dora ..	W. F. Jacob, Kiwitea, Feilding	Aged	350·0	365	11,518·70	422·95
	AYRSHIRES.					
Newton Gipsy ..	Moumahaki Experimental Farm, Waverley	3 306	307·6	365	8,964·00	351·39

Pukatea Timber.—Mr. E. Phillips Turner, of the Lands Department, supplies the following reply to a correspondent who inquired as to the value of this tree: Pukatea, though in the past almost entirely neglected, is a timber of very high quality. It is tough, light, and soft, and when sawn "on the back" has a very beautiful figure. The colour of the heart-wood is a light brown with darker waves. It has been used to a small extent for boat-building, but its proper use is for furniture and cabinet-work. It should be suitable for three-ply and veneer work, and any one possessing a considerable quantity of the timber, and wishing to dispose of it, should communicate with Messrs. Ellis and Burnand, of Hamilton, who have a three-ply and veneer plant at their mill at Manunui. Large furniture-makers would probably also purchase the timber. Pukatea is a close relation to the "stink-wood" of South Africa, which is so highly valued for furniture that it sells for 2s. per cubic foot on the stump.

MACHINE SHEEP-SHEARING AND NATIONAL EFFICIENCY.

J. L. BRUCE, Assistant Director, Live-stock Division.

In addition to the military service of the many thousands of gallant men who have gone and are going to "do their bit" at the front, a solid task remains for those of us who must stay behind, and that lies in increased production from the land. With the shortage of men this can only be done by "efficiency," in making use to the fullest extent of every appliance which science and invention have placed at our disposal. There are many directions in which the use of labour-saving appliances could be introduced into our agricultural and pastoral operations. One of these, although rapidly coming into general use, should, in the writer's opinion, become universal. Shearing-machines are referred to. The majority of the larger sheep-owners in this country have come to recognize the advantages of "machines" over "blades." This has been partly, in the first instance, brought about through the difficulty in obtaining good blade shearers. After a season's trial it was found that the use of machines was a highly profitable investment, owing to increased clip (particularly in the first season), better work, quicker despatch, and less knocking about of sheep. Furthermore, the shearers can earn 20 to 40 per cent. more money with less exertion, and there is also no scarcity of learners, who soon acquire the art of handling the machines. Under present conditions blade shearers are becoming more difficult to obtain each year, and the small sheepowner has difficulty in getting his sheep shorn. The question thus arises, Should not every sheepowner install shearing-machines? Some may say, "I am getting along all right without them"; and others, "Will it pay?" The former may be asked how long he is sure of being able to get along without them. When unable to do the work himself he will then feel the pinch, and in any case it pays to machine-shear. Some may advocate co-operative ownership of a shearing plant where a number of small holdings adjoin. This plan may look well in theory, but is as a rule disappointing in practice. Another method is a travelling plant. This has many points to commend it, and is preferable to the former plan; but, all things taken into consideration, every man with, say, two hundred sheep or more should possess his own plant. He can purchase and have

erected in his shed a two-stand plant with 1½ h.p. engine at a cost of from £110 (engine £50, plant £60), and if short of ready cash he can obtain most liberal terms. With £10 worth of extra wool (at present prices) from his first clip with the machine, and prices 55 per cent. over those received for the 1913–14 season, upon an 8 lb. to 9 lb. clip he will have more than half paid for his machine the first season. A larger engine than a 1½ h.p. would, however, be desirable, even for a small number of sheep. A light engine is equal to driving the machines, but with, say, a 2½ h.p. engine at about £70, or even a 4 h.p. engine at about £90, the extra expense would in most cases well repay the owner. There is nothing more useful about a farm than cheap and effective motive power, and either of the stronger engines, preferably the 4 h.p., can be used for chaff-cutting, wood-sawing, pumping water, &c. The crux of the matter is that in the present crisis it is our duty to avail ourselves of every method which will assist towards national efficiency, and in this unequalled pastoral country, with its twenty-five million sheep, the shearing-machine must play a very important part.

SEED-BED METHOD OF RAISING MANGELS, ETC.

In districts with an abundant rainfall weeds are a great source of trouble and expense in connection with the growing of mangels. A practice sometimes followed with advantage under such conditions is to sow early in a seed-bed. The main paddock is prepared by occasional cultivation, during which the manure is drilled in and cross-drilled—this practically acting more or less as a harrowing. The land is kept cultivated, and therefore free of weeds, until the plants in the seed-bed are of a size to transplant, when furrows about 28 in. apart are run in the paddock, the plants laid on the edge of the furrow, and the earth returned by the plough. The paddock may then be rolled if necessary. The ground is thus kept clean until the plants have got possesssion, when the balance of the work between the drills can be done with the horse-hoe as usual. Much tiresome thinning and hand-weeding is avoided by this method, and few gaps occur through failure. The same method can also be adopted in the growing of other crops, such as kales, chou moellier, cabbages, &c. Very few losses occur if a kerosene-tin a quarter full of cow-dung and filled up with water is taken along the row and the roots of each plant dipped in the mixture before being laid in the furrow.—*G. de S. Baylis, Fields Supervisor, Napier.*

TOMATO-CULTURE.

W. H. TAYLOR, Horticulturist.

HAVING grown tomatoes in the open ground for forty consecutive seasons and under glass for more than twenty years I can at least claim to have had opportunities for observation. I have long believed that the tomato is generally cultivated along wrong lines. Because it is a succulent, strong-growing plant it is thought that "it must require a lot of feeding." As well might we say the same of the American aloe, a plant that can make its enormous growth and send a flowering-spike like the mast of a boat, twenty or more feet high, out of a bed of rubble on a dry hillside. Again, the herbaceous calceolaria is a succulent plant having an appearance that causes the belief that it must require a lot of water: as a matter of fact, the numerous failures that occur in attempts to grow the plant are because too much water is given—it really requires a quite moderate supply.

With the tomato the aim should be to check growth, not to foster a gross habit. My own practice for years past has been to use no animal manure, which I believe causes blight except under dry conditions of soil. Manure is safe to use in a dry season but fatal in a wet season, and we cannot forecast the weather. I never water outdoor tomato-plants, but have never failed to secure an excellent crop, and have experienced only two attacks of blight during the past twenty years, and then only slight attacks and from recognized causes. Regarding glasshouse culture, I am convinced that most of the losses incurred by growers—and they have been many and great—were caused by a too-wet condition of soil and atmosphere. Several years ago the Department was called on to investigate the cause of non-setting of fruit. Experiments were carried out in houses lent for the purpose, and in collaboration with the owners, and it was eventually agreed that the cause of the trouble was too much moisture. My own conviction has long been that the ideal conditions for tomato-growing should include warmth, sunshine, and rather dry conditions, and that given these conditions there would be no blight. My own experience has strengthened this opinion.

CULTURE UNDER GLASS.

Apart from raising the plants, and excepting in places where severe frosts occur, tomatoes can be grown under glass without artificial heat and be ready for market in December, or in extra warm

places in November. To secure the earlier supply the plants should be set out in July.

RAISING THE PLANTS.

The seed should be sown about the second week in May. Those who have not a heated greenhouse will find a hotbed covered with a frame answers admirably for this purpose. The manure should be turned over several times, and well shaken to remove all knots. Two or three weeks should be given to the preparation of the manure, as it is desirable to remove all rankness and to secure a gentle and dry heat. The seed should be sown in shallow boxes; too much soil encourages deep rooting and soft plants. Scatter the seed rather thinly, as crowded seedlings are weak. Pricking-off should be done as soon as the seedlings are large enough to handle. The boxes for pricking the plants into should be shallow, the depth being limited to enable the roots to quickly take possession of all the soil, and also to economize labour; 3 in. deep inside measurement is ample. Allow the young plants a space of about 2½ in. each way. No more water should be given than suffices to keep the plants growing, and this will be comparatively little at the season in question. The soil in the boxes should be mainly fairly good loam, with a little very old manure, and sand if required to keep it open; a small proportion of wood-ashes is also useful. To prepare the boxes, first put in a layer of stable manure that is in a half-decayed littery condition, and not in a wet state. After being pressed down the manure should nearly half-fill the box. Heap the box up with soil and stroke off the surplus with a piece of batten, so as to leave it level-full; press the soil moderately firm with a piece of board, and then mark out the lines for the seedlings by pressing in a strip of lath at the required distances. The boxes of seedlings should be returned to the hotbed; bottom heat encourages root-growth; abundant ventilation will ensure firm and stocky plants. When sufficiently grown the plants should be placed in the house to harden for a week or two before they are planted.

FRAMES FOR RAISING THE PLANTS.

If the plants are to be raised on hotbeds, or later for outdoor culture, frames will be required. It may be as well to say here that except for use on hotbeds frames are not recommended where large numbers of plants are to be raised. Low-roofed, narrow houses are more economically worked, are built at less cost, and are less costly to maintain in repair. A convenient size for a frame would be one that would carry lights 6 ft. by 3 ft. To carry lights of those dimensions the ends of the frame should be 5 ft. 9 in. wide, the back 2 ft. high, and the front 1 ft. high. The sides should be 1 in. totara or

matai boards, well primed with red-lead, and painted with two coats of white-lead and oil; or if preferred they may be creosoted, which is less costly and equally preservative, though the appearance is not so good. Corner studs of 3 in. by 2 in. or 4 in. by 1½ in. must be put in, these being cut level with the bottom boards. Rafters of 3 in. by 2 in. must be put on to carry the lights where two meet. Before nailing these in their places run a good plough-groove down each side to carry the water that will run off the sides of the lights. Between the grooves nail a 1 in. strip to keep the lights in place. If the frame is to be portable, two lights are the most convenient size. If they are to remain as fixtures there may be any number of lights. The frames should be elevated a little above the surrounding ground. The best plan is to stand them on a row of bricks; the frames then stand firm and true, and if the bricks are given a good coat of tar before the frame is placed on them it will preserve the wood and shut out woodlice.

DRAINAGE.

Perfect drainage is absolutely essential. The lower the water-table the better; it should not be within 3 ft. of the surface. It should be comparatively easy to add to the depth of the soil by carting sufficient to raise the surface inside the house, and this would give the additional advantage of raising the level above that outside.

SOIL PREPARATION AND MANURING—FIRST YEAR.

Any fairly good garden soil will grow tomatoes, but new soil is to be preferred. There is always danger of soil long in cultivation containing disease-spores, and this is especially the case where the land has been long cropped with vegetables. There is no need, however, to avoid such soil if the exigencies of the case render its use advisable; but no opportunity should be lost to add new soil, if only a few inches deep. The manuring of new soil is easier than old, as its requirements can be more easily estimated; old soil may be already rich in the properties that induce green growth. Soil taken from an old upland pasture, cut out about 3 in. deep and stacked turf downward till the grass is dead, is the best new soil to add. Prior to planting, the soil should be deeply dug and left with a rough surface, so that it may be well aerated.

Before planting give a dressing of superphosphate and bonedust, 1 oz. of each per square yard, and sulphate or nitrate of potash, ¾ oz. per square yard. Potash is at the present time expensive and difficult to obtain, and may be omitted if a dressing of wood-ashes sufficient to cover the soil is given. The ashes, however, should have been kept quite dry, as if rain has fallen on them a proportionate

quantity of potash will have been washed out, according to the extent of the exposure. If the soil is poor in humus sulphate of ammonia, ½ oz. per square yard, may be given, but otherwise should not be used, as it merely promotes green growth, an excess of which makes the plants unduly susceptible to blight-attacks.

Constant treading on the soil—unavoidable in attending to the plants—is likely to make the surface hard. This condition of soil should be prevented. All necessary attendance can be given by walking on alternate rows, and the soil in these rows can be protected by a mulch of dry littery manure.

PLANTING.

It is desirable that the soil be made somewhat firm before planting. Soil that is very loose is quickly dried by evaporation, so that much watering would be necessary, and excess in watering should be avoided. Loose soil also promotes growth of a flimsy nature. The nature of the soil may be such as to ensure the necessary firmness by merely levelling it over with a rake, but if it is very light it should be well trodden down or, better, have a light roller passed over it.

If the plants have been well prepared the roots should carry practically all the soil of the boxes, including the manure that was placed on the bottom of the latter. The best way to handle the plants is to knock one end off a box, when the whole contents can be slipped off and the plants pulled apart without injuring the roots. To plant, first brush aside dry crumbs of soil on the surface with a trowel, dig a hole amply large enough for the ball of roots and deep enough to admit 2 in. or 3 in. of the stem above the ball. Cover the roots with the soil that was dug out, pressing it firmly over the ball. Unless the soil be very dry no water should be given at this time.

In regard to distance apart in planting, the general tendency appears to be to plant too closely. Close planting does not necessarily produce more fruit; it certainly demands more watering, and incidentally creates a moister atmosphere and favours attacks of blight. It is suggested that 24 in. by 12 in. is close enough for small houses, and that 30 in. by 12 in. is a better distance to adopt for large houses. The closer the plants are to each other the more watering is necessary and the greater the risk from blight-attacks. A little extra space between the plants also permits a better circulation of air and more sunlight on the plants. The securing of these conditions should be sufficient compensation if there were no other benefits, but it would be reasonable to expect a sufficient increase in weight of fruit per plant to bring the aggregate crop at least equal to the weight that would be obtained by closer planting.

TRAINING THE PLANTS.

An iron bar, $\frac{3}{16}$ in. by 1 in., should be screwed to the rafters along each side of the house from end to end, about 6 ft. 3 in. from the ground (so as to give head-room); then light wires stretched from these across the house above where the rows of plants will be. Over the centre path a stronger wire should be stretched from end to end of the house on the same level as the cross-wires. A few lengths of strong wire attached to screw-eyes fixed to the apex of the roof and hooked on to the centre wire will prevent the cross-wires from sagging. From the cross-wires suspend a length of binder-twine for each plant; the lengths of twine should reach the ground, and may be fixed by tying each to a short peg of wood thrust in the ground. As an alternative, the twine may be lightly tied to the bottom of the plants, but of course this cannot be done until the latter have grown somewhat. As the plants grow they should be twisted round the twine, no tying being needed. The plants should pass round the twine northward from east to west; they will then retain their position, that being the direction in which all climbing-plants travel upwards—namely, with the sun.

PRUNING.

The plants should be restricted to single stems, all side shoots—with an exception which will be described—being pinched out as soon as they are seen. The top of each plant should be pinched when the required number of bunches of fruit have been secured, five or six bunches being usually considered sufficient; the exception mentioned above is thus explained. The reason for growing tomatoes under glass is, of course, to get early fruit, and it is important that the plants set the lowest bunch of fruit. Some strains, however, will not do this, and in such cases it is good practice to allow a shoot from the base of the plant to extend till it shows a bunch of fruit, and stop it above the next two leaves. By this means an extra bunch per plant of early fruit is obtained on each plant, this in a large house amounting to hundreds of pounds weight. The leaves on the main stem should be retained. The best plant for glasshouse work is one that has leaves of medium size. Some varieties have very gross leaves, and these should be reduced to medium size by cutting off about one-third of each, the formation of the leaves rendering this possible without impairing their functions. When a bunch of fruit has been cut the leaves immediately above it should be removed. Leaves that are below fruit are useless, and also become worn out; their removal aids the circulation of air and relieves the plants.

VENTILATION.

It is now becoming generally understood that a close moist atmosphere and blight are synonymous—one following the other. The means for ventilation should be ample. Large houses should have a door at each end; both can be opened during quiet weather,

A PROPERLY PRUNED TOMATO-PLANT.

Laterals removed. If foliage is very heavy leaves should be shortened where marked by thick lines.

and one during rough weather. With two doors neither top nor side ventilators need be extensive. The amount of ventilation given and the manner of applying it should be ruled by circumstances; there can be no hard-and-fast rule. Early-forcing houses require most care,

and naturally in such cases ventilation should be almost entirely from the top. With unheated houses the position is quite different. It is not so much increased heat that is sought for as protection from the inclemencies of the weather, and consequently a more equable temperature. Extremes in temperature should be avoided, and at times this will require all the ventilation that can be applied. Not only is free ventilation safe, it is very beneficial to the plants, giving them solidity of substance and rendering them blight-resistant. If the atmosphere is kept moderately dry, air can be allowed to pass freely through the plants, and they will benefit by it; but this would not be safe with a wet house, a state which I say should not exist.

WATERING.

With a view to preventing a great change of temperature in the soil, which would cause a check, watering should be done when the soil is at its coldest, and naturally this will be early in the morning. The soil will then have the benefit of increasing sun-heat, will gradually warm up, and most of the evaporation will be over before closing-time. The house can then be closed in a fairly dry state, will retain warmth longer, and the atmosphere will remain moderately dry through the night. However dry the house may be, a certain amount of moisture is bound to gather during the night; it will, in fact, never be absolutely dry. The amount of water necessary is a much-debated phase of tomato-culture, but, as already indicated, I have no hesitation in saying that in general practice far too much is given. Experimental work has proved that the tomato thrives in very dry soil, and is then quite free from blight. The plants should never be syringed except for the purpose of applying insecticides or fungicides.

FERTILIZING THE FLOWERS.

An overmoist atmosphere prevents the dispersal of pollen. It should be remembered that house plants are practically deprived of the aid of wind and insects, which are the chief pollen-carriers in open-air culture, where also the pollen is dry the greater part of the time. The atmosphere of a house should be dry during the greater part of the day, so that the pollen may be easily dispersed. This process is assisted by a slight agitation of the plants, to be effected in a simple manner by smartly rapping them with a light cane, or by drawing the cane quickly along the rows of twine, precisely as is done in vineries to help shy setters. The time to carry out this operation is the middle of a fine day.

PREPARATIONS FOR THE SECOND YEAR.

Preparations for the second year may be said to begin with the clearing-out of the old plants, and this should be done in a thorough manner. The roots of the plants should be forked out, the twine cut from the wires, and the whole removed and burned. The ashes from the burning should be returned to the soil, thus replacing a considerable portion of the mineral matter taken out by the plants. The soil should be dug up and left rough as before, so as to expose as much surface as possible, and the doors and ventilators opened wide, abundant light and air having a purifying effect on the soil. It is well known that the excreta from the roots of the tomato-plant are poisonous to future plants of the same kind. In open-air cultivation the poison is not present in sufficient quantity to affect a second crop, but it is injudicious to attempt to get a third crop from the same soil. In glasshouses the plants are grown closer together, and the toxic secretions are therefore proportionately larger. Aeration of the soil must have some cleansing effect, but it seems advisable to supplement this by growing some vegetable crop that may take up some of the deleterious matter. Field-peas are suggested for the purpose, as they are deep-rooting, rapid in growth, and decompose quickly after being turned under. Peas, however, will not do much good unless they are made to grow strongly, and as the soil will be dry if the tomatoes have been properly treated, it should be well flooded with water, the peas to be sown when the water has settled down. A dressing of superphosphate, 2 oz. per square yard, or 4 oz. of basic slag, should be given to ensure good growth in the peas. The green crop should be turned under in time to allow for the violent fermentation to take place before planting. Carbonic-acid gas, which is generated by fermentation of green matter, is poisonous to sprouting seeds, and is likely to be injurious to soft-wood plants. If it is possible to add some new soil, as advised earlier, there can be no doubt that will be more beneficial than anything else, and such an addition should supplement the green crop.

CULTIVATION IN POTS.

Tomatoes are successfully grown in pots, a method that is convenient for the production of early fruit where the house is furnished with plant stages and they cannot be planted in the ground. In a span-roofed structure the plants may be trained on wires under the roof, but it is not worth while to attempt it if other plants which require heavy shading are grown in the house. Tomatoes will not succeed under heavy shade; light shading will not hurt them, but if they are properly grown they require and are best with very little.

A lean-to house is better adapted to pot culture on a small scale than a span-roofed house, provided it faces nearly north, so as to secure the greater amount of sunshine. The upper portion of the glass roof should be left unshaded. A wooden trough, 12 in. by 12 in., can be used in place of pots, and is really much better. As the roots of the plants will be confined to a small space, methods of cultivation must be very different to those of ground culture. The soil used should be good turfy loam, with a little very old manure, and bone-dust equal to a 5 in. potful to a barrow-load of compost. The loam should be broken by hand, not riddled, as that would remove the fibre, which it is important to retain. The only drainage required is provided by shaking most of the soil from some of the turf, and placing the latter in the bottom of the pot. The whole contents of the pot will thus be rooting-material, which is an important point. for were it otherwise larger pots would be required.

Plants for this method of culture should have been raised in small pots, first in 3 in. size, then moved to 5 in., planting in the larger pots as soon as the points of roots show freely through the soil. The larger pots should be only half-filled with soil, the ball of the young plant placed on the soil, and sufficient soil added to cover it, and pressed very firm. No more soil should be added until the plant is a foot or so above the pot, when it should be filled up. The plants will require frequent watering, and while the fruit is swelling liquid manure should be given two or three times a week. After the pots have been filled with soil new roots will push from the buried portion of the stem, and the plant will be greatly strengthened, so much so that the increased vigour of the plants may demand more root-room. This can be given by laying strips of fibrous turf round the rim on the pot and filling up with soil. Roots may come through the top of the soil, in which case give them a mulch of dry horse-droppings; these may be piled up, as water will pass freely through them. During twenty years' continuous practice in pot culture I never experienced an attack of blight. Probably the elevation of the plants from the surface of the soil, thus securing a dryer atmosphere, accounts for this immunity.

[Open-air culture will be dealt with in the next issue of the *Journal*.—ED.]

Lyons Fair Information Bureau.—A commercial information bureau has been established at Lyons, France, in connection with the Lyons Fair. In drawing attention to the new service the administration of the fair states that the bureau is intended not only to reply to the numerous communications received by it from all parts, but to develop the relations which are thus becoming established between the manufacturers represented at the fair and the traders of the world. It may be mentioned that the principal aim of the Lyons Fair is to take the place of the Leipzig Fair as an international institution. The two annual fairs already held at Lyons have been a great success.

ECONOMICAL AFFORESTATION IN NELSON.

THE FRUIT-CASE TIMBER SUPPLY.

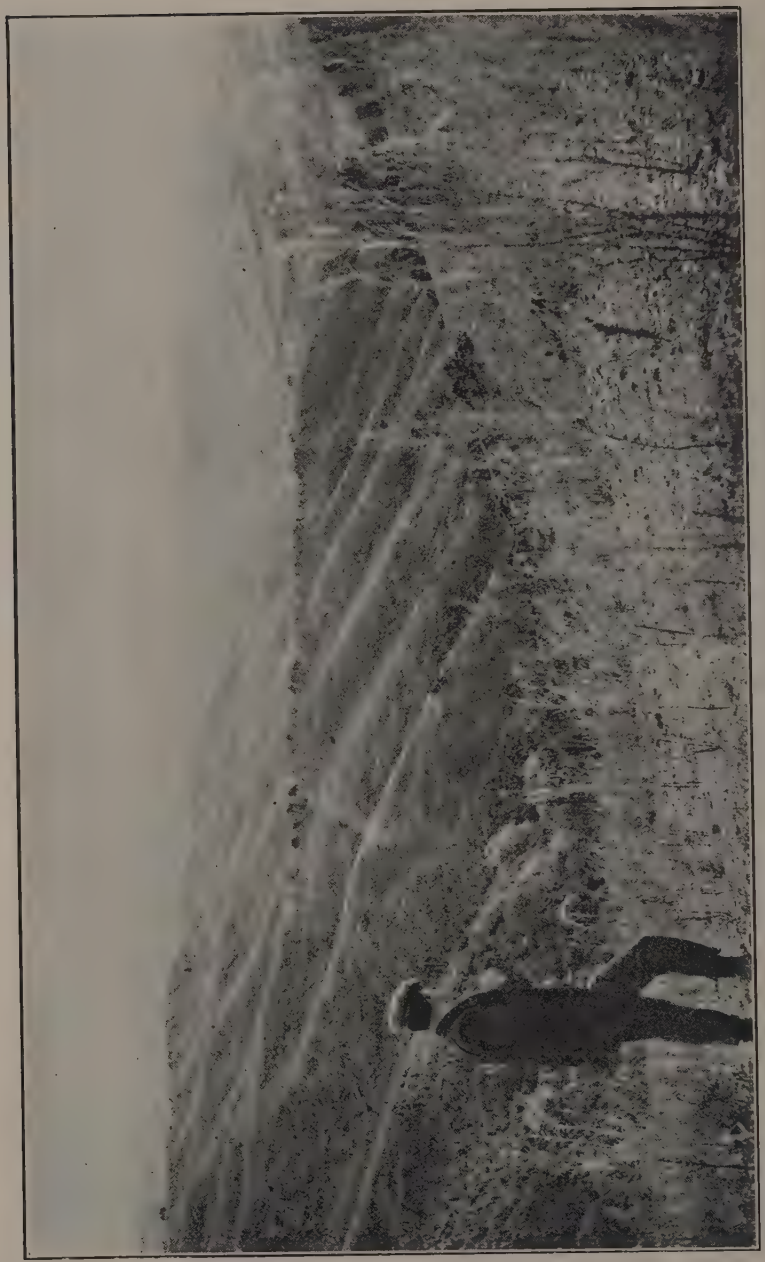
H. G. KINGSLAND, Appleby.

How to utilize waste lands is a subject which interests many farmers. As far as we Nelson farmers are concerned—especially those on the newly broken-in country — the question is of pressing importance. High land-values are the rule, and on almost every farm there is more or less waste land which is too poor to grow grass and too steep or otherwise broken to be used for orchards. On small farms it is of the utmost importance that this land should do its bit towards keeping the family pot boiling. The remedy suggested by the writer is afforestation. The purpose of this article is to show how cheaply and easily this can be accomplished, how certain are the results, and great the ultimate profits.

An average fruitgrower uses as much timber to market his crop annually as would build him a fair-sized house. There is, roughly, equal to 4 ft. of timber in an imperial standard case. A grower with 15 to 20 acres of orchard would have perhaps four thousand to five thousand cases of fruit. Thus his annual consumption of timber for cases alone would amount to 16,000 ft. to 20,000 ft., or sufficient to build an eight- or ten-roomed house. It does not require a very vivid imagination to gain some idea as to the quantity of case material we shall require in the immediate future. I think it would be quite safe to say that the amount of land employed in growing apples would require to be exceeded by that growing apple-cases.

PINUS INSIGNIS THE TREE.

Bearing these facts in mind I set out to experiment several years ago. I have had all sorts of timber cut into cases, including willow, Lombardy poplar, birch, and *Pinus insignis (radiata)*. They all do at a pinch, but have certain drawbacks. Willow is too inclined to warp, and there is also trouble in getting timber of requisite size and straightness. Poplar is fair, but there is a big waste in cutting the timber owing to the deep flanges on the trees, also the timber is rather soft, which makes it difficult to get the nails to hold. Birch is too heavy and apt to split. Now that white-pine is practically exhausted, undoubtedly *Pinus insignis* is *the* timber for cases. The



COUNTRY NOW BEING PLANTED BY THE MOUTERE PINES COMPANY.

wood is tough, odourless, not very liable to crack, and, provided the cases are kept under cover and made up within a reasonable time after cutting, it retains a fair degree of whiteness. For these reasons I am devoting myself to *Pinus insignis*. This pine seems to thrive and grow quicker, locally, on the poorest barren knobs and steep faces from which all the soil has been washed.

HOW THE TREES ARE ESTABLISHED.

The problem, then, of how to economically establish trees on these steep faces and ridges presented itself. Undoubtedly if the land can be broken up and kept cultivated the trees come away much quicker.

PLANTING PINUS INSIGNIS ON MOUTERE HILLS WITH MINERS' PICKS.

But usually that course is impracticable, and even if it were possible the cost to an impecunious orchardist would be excessive. At the commencement we used two-year-old trees, but the cost, both of the trees and of planting them on rough country, was too great, especially when large areas had to be planted.

Three years ago I decided to strike out on my Pigeon Valley property with yearlings planted in the scrub, and the results have exceeded expectations. In the first place, the percentage of misses was no greater than with two-year-olds, and the trees have grown very satisfactorily. After the first year or two it is doubtful whether there is much difference in the rate of growth between these and those planted on cultivated ground. I certainly think that at the end of five years no appreciable difference could be noted between

trees started with cultivation and those without. Another point we have noticed is that trees planted in short scrub seem to come away quicker than those planted in the open; the scrub seemingly protects and draws them up. This is not so among gorse, however, which has rather a retarding effect. In future we will burn off, before planting, all areas showing any growth of gorse.

The way pine-trees thrive and grow on our poor Moutere hill-country is nothing short of remarkable. In the last few years pines of all descriptions have been coming up from seed among the scrub. I have noticed a *Pinus insignis* which had come up through a dense bush of manuka. The pine in its effort to get to the light had run up 7 ft. or 8 ft., and was no thicker than a man's forefinger.

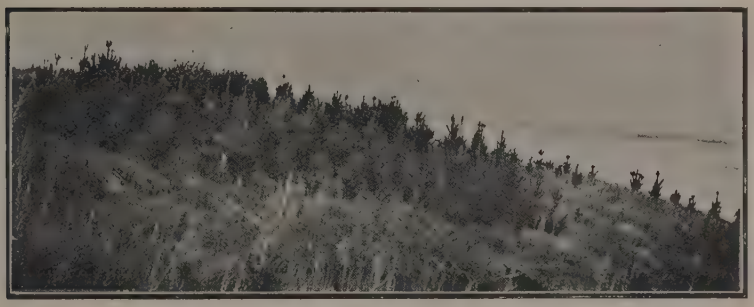
PINUS INSIGNIS, PIGEON VALLEY.
Three years' growth from a yearling.

At first the planting was carried out with a spade, but latterly we have used a miner's pick with a short handle, and the results have been equally good, combined with greater convenience. With this style of planting on the roughest of country—in places, in fact, that men often have trouble to climb—a man can plant a thousand trees per day. The men carry a supply of yearling plants — say, three or four hundred—in a bag slung over the back, and work from bases, just taking sufficient plants to see them out and back, so that there is no waste time walking about. In this climate we have found that the best results are achieved by planting fairly early in July or August — certainly not later, the percentage of misses in September planting being much greater.

FIRE-BREAKS.—FENCING.

In regard to the fire danger, we have guarded against it up to the present by burning fire-breaks. This is done just at the commencement of the dry season—say, in December—when the fires can be controlled.

Fencing caused me no little concern at the commencement, the cost in small areas being often greater than the total cost of trees and planting. Lately I have dispensed with fencing also. Cattle are very destructive, but sheep do not seem to bother the trees much, nor do hares. The latter are severe on fruit-trees, but do not seem to touch the *Pinus insignis*. Of course, these remarks on fencing will depend largely on local conditions. For instance, the Rabbit Island Domain Board, which has been planting small areas after this style for several years, finds it absolutely necessary to fence and net everything securely, as rabbits happen to be very numerous in that particular locality. On the other hand, so far as the bulk of our Nelson fruit country is concerned—the Moutere lands in particular—



PLANTATION OF PINUS INSIGNIS ON MOUTERE HILLS.
Five years' growth from yearlings.

my experience has shown that it is safe to plant without fencing, and the larger the area planted the less risk is there relatively of damage from sheep, hares, deer, &c.

THE FIREWOOD FACTOR.

In writing this short article I have always had in mind that the remarks were particularly applicable to settlers in our new apple country in the Nelson district. On this class of country settlers are usually destroying every stick and scrap of firewood—natural forest there is practically none—and coal has to be brought in over bad roads. The man with timber plantations of any description will have a very valuable asset for firewood purposes in about ten years. For this purpose it is not a question of waiting for twenty years. The thinnings can be used for firewood and will yield a very handsome return quite as soon as an apple-orchard. Every farm should have a plantation of trees; it is as necessary in household

economy as the family cow and the kitchen-garden. When one considers the pressing need and the present inadequacy of our national efforts at afforestation it is sufficient to cause every thinking man alarm. Thousands of acres in the Nelson District at present lying idle would grow pines admirably.

NOTE.—The matter of protection of young trees from live-stock must be treated with every caution. The methods described by Mr. Kingsland in his very useful article have doubtless proved satisfactory in the locality referred to, where sheep are not numerous. The common experience, however, is that sheep are very destructive to *Pinus insignis* and similar young trees. In ordinary circumstances sheep should not be admitted to pine plantations before the trees are at least 6 ft. high. The nipping of the young trees by sheep tends to produce more than one leader, which spoils the growth for timber purposes.—EDITOR.

POISONING RABBITS WITH STRYCHNINE.

WITH reference to the use of strychnine for poisoning rabbits, Mr. G. H. Blair, of Hillend, Balclutha, forwards the following informative note. In drawing attention to this method it is advisable to give a reminder of the intensely poisonous nature of strychnine—even in minute quantities—to human beings, and of the necessity for inexperienced operators to observe extreme precautions in handling the poison. Mr. Blair states,—

I have had three years' experience poisoning rabbits with strychnine. My method, which I have found most successful, is to put 15 lb. of oats into a kerosene-tin, add 2 lb. of molasses, fill up with water, stir to dissolve the molasses, and boil till the oats are soft; then strain off the liquor. With oats treated thus I feed the rabbits three times, then poison by shaking one teaspoonful of powdered strychnine over 3 lb. of the boiled sweetened oats prepared in exactly the same way as for feeding. For feeding I lay baits of about one tablespoonful of the oats 5 yards apart, and baits of one teaspoonful of the poisoned oats for poisoning. I find it a good plan to count the baits laid, as I can then mix almost the exact quantity of poisoned oats required, there being, roughly, 210 poisoned baits in 3 lb. When mixing a big quantity, 24 lb. of boiled sweet oats go to 1 oz. of strychnine. The liquor strained out of the oats can be used over and over again if kept clean and sweet, and I just add about half the first quantity of molasses when using it again.

So far this season I have used 3 oz. of strychnine and picked up 1,101 rabbits, and this on ground that trappers could not get good catches on. All my neighbours are using this recipe with great success for coping with bunny, and have given up entirely the use of phosphorized pollard and oats in favour of the above. I have had a lot of inquiries this season from all parts of Otago and Southland.

I may add that I always use the rabbit carcases that I get handy to the homestead for feeding the dogs, pigs, and poultry, and so far have not observed any evil results from so doing—in fact, I sun-dry surplus carcases to keep me in dog-feed when not poisoning. I forward a photograph showing a heap of 470 rabbits I picked up one morning off a 100-acre paddock, and every carcase has been consumed by my own and neighbours' dogs. Of course, I remove the stomachs unbroken and bury them, but even the entrails have no apparent effect on animals eating them.

HOW TO DESTROY DISEASED BEEHIVES, ETC.

THE following method is recommended to persons who are required to destroy diseased bees or appliances :—

Wait, if possible, until evening, when the bees have ceased flying. Dig a hole about 1 ft. deep, as near the hive as is safe—the hole to be somewhat narrower than the hive ; then lay and light a fire in the hole, and when well ablaze quietly lift the hive from the bottom-board and place it right across the fire. After a minute or so, when the bees are dead, take off the lid so as to allow the fire to burn through the frames. When all the material has been burnt fill in the hole, taking care to cover the ashes. Every care must be taken to avoid leaving any of the honey or wax unconsumed by the fire.—*G. V. Westbrooke, Apiary Instructor, Auckland.*

DEFECTIVE THRESHING-MACHINES.

REPRESENTATIONS have been made to the Department that many of the threshing plants in the country districts commence the season's operations in more or less faulty condition, resulting in serious loss of grain in the straw. There seems to be no doubt that a certain percentage of loss, amounting to a good deal in the aggregate, is caused by defective beaters in the machines, especially where tight-glumed varieties of wheat such as Solid-straw Tuscan are largely grown. These conditions mean a loss to both farmer and threshing-mill owner, and, moreover, have an appreciable bearing on the wheat-supply of the country. It has been suggested that the Government should inspect threshing plants. This, however, would necessitate legislation, and probably also the appointment of additional inspectors to undertake the work. The present circumstances of the country are unpropitious in regard to each of these factors. The Minister of Agriculture, therefore, earnestly appeals to threshing-plant owners to ensure that their machines are in first-class order for next season's operations. By so doing they will be rendering good service in the cause of national efficiency.

Export of Honey.—By Order in Council gazetted on 23rd August, 1917, the Bluff is added to the list of ports for the grading of export honey, and the Bluff Harbour Board's cool store is appointed the honey-grading store thereat.

THE HAWKE'S BAY FARMING DEVELOPMENT ASSOCIATION.

A GOOD MODEL ORGANIZATION.

G. T. DE S. BAYLIS, Fields Supervisor, Napier.

AFTER a considerable amount of preliminary organization work a very promising joint movement for agricultural advancement has recently taken concrete shape in this district under the name of the Hawke's Bay Farming Development Association.

The new organization is designed to work locally in conjunction with the Department of Agriculture, and incidentally will supersede the system of small co-operative experiments conducted by the Department with individual farmers. The main objective of the association is greater agricultural development and production Although incidentally it must do a great deal of experimenting, the association does not exist primarily for making experiments, but for the purpose of encouraging by demonstration and assistance the greater development of the agricultural and pastoral resources of the district.

The contributing bodies are the Hawke's Bay County Council, the Waipawa County Council, the Waipukurau County Council, the Hawke's Bay Agricultural and Pastoral Society, the Provincial Executive of the Farmers' Union, and the Napier Harbour Board. Each of these bodies contributes to the funds of the association, and each supplies two delegates for the General Committee, one of which delegates is also on the executive. The Department has agreed to subsidize the operations on certain defined lines.

INITIAL OPERATIONS.

The association is starting operations upon an area at Waipukurau to test the grazing value and money value of top-dressing old pasture. On the Ruataniwha Plains, Takapau, the operation of an area is being undertaken with a view to the increase of the carrying-capacity of the plains by the utilization of lucerne and other forage crops as assistance to the pasture. Records are to be kept showing the cost of grazing and the stock carried. An area of grass plots to demonstrate the character and value of varieties of grasses will also be established here. At Rissington a fairly extensive area of grass plots will be laid down. At Patoka somewhat larger plots are to be laid down to test grass varieties suitable to the light pumice land of northern Hawke's Bay. Also an area will be prepared for

the putting-down of permanent pasture, of which records of cost and stock carried are to be kept. Among other activities an endeavour is to be made to develop the seed-growing industry in Hawke's Bay.

The association will pay for all work done at a rate agreed upon previously.

RULES OF THE ASSOCIATION.

For general information, and especially that of other districts where similar movements are being projected, the full rules of the association are appended. Particular attention is drawn to Rule 12, "Inspection of Operations," which was embodied for the purpose of ensuring interest being maintained in the work.

1. *Title.*—The association shall be called "The Hawke's Bay Farming Development Association."

2. *Object.*—Its object shall be to assist the Government Department of Agriculture in the greater development of the agricultural and pastoral resources of Hawke's Bay,—

(*a.*) By locating in the various districts the factors required for obtaining the best results from the land:

(*b.*) By locating in the various districts factors which at present hinder the best results being obtained from the land:

(*c.*) By carrying out experiments, when necessary, in order to obtain information under (*a*) and (*b*):

(*d.*) By demonstrating on fair-sized areas the results of information obtained by means of experimentation, and also methods of husbandry suggested as suitable to certain districts and soils, such demonstrations to show costs and returns:

(*e.*) By endeavouring to develop the seed-growing industry in Hawke's Bay, and any other industries suitable to the farming-lands of the district:

(*f.*) By developing the principles of co-operation in the formation of seed-growers' circles and beneficial co-operation in other directions where practicable:

(*g.*) By promoting when desirable the introduction of plants new to the district, and also the growing of crops other than such as have already been grown in the district:

(*h.*) By taking steps to assist association seed-growers or pioneers of new lines of husbandry to procure markets for sound products so grown or procured:

(*i.*) By collecting and recording information likely to be of value to the various districts included in the association's area:

(*j.*) By obtaining information about, and generally to keep in touch with, recent developments in agricultural machinery and labour-saving devices for the farm:

(*k.*) By generally encouraging and promoting high standard of farming amongst the settlers in the association's area, with a view to increasing the average returns from the lands comprised in that area:

(*l.*) By disseminating among farmers from time to time the results of the work of the association.

3. *Boundaries.*—Its operations shall be confined to the area contained within the boundaries of the various counties contributing to its funds.

4. *Constitution.*—The association shall consist of representatives of the various bodies who contributed funds towards its formation, viz.: The Hawke's Bay Agricultural and Pastoral Society, Hawke's Bay County Council, Napier Harbour Board, Hawke's Bay Provincial District Branch of the New Zealand Farmers' Union, Waipawa County Council, Waipukurau County Council, and of any other bodies whose admission is agreed to by the General Committee and who contribute towards the association's funds.

5. *General Committee.*—The General Committee shall consist of two members elected by each contributing body, with the Government Fields Supervisor for the district as an *ex officio* member. Before the month of June in each year each

contributing body shall be asked to appoint its representatives on the General Committee for the ensuing year, and members shall hold office until their successors are appointed. In the event of vacancy, body to elect another.

6. *Meeting of Committee and Election of Officers.*—A meeting of the General Committee shall be held in the month of July of each year, and shall be called the "annual meeting," at which the Executive Committee, chairman, and vice-chairman shall be elected for the ensuing year, and the annual report and balance-sheet shall be presented by the outgoing chairman. A copy of the annual report and balance-sheet shall be forwarded to each contributing body as soon as possible after the meeting. Other meetings of the General Committee shall be called by the chairman as required, but the chairman shall at any other time call a meeting on the requisition of members representing any three contributing bodies. Seven days' notice shall be given to each member of all meetings of the Executive Committee.

7. *Executive Committee.*—The Executive Committee shall consist of one of the two members of committee representing each contributing body, and shall be elected by ballot of all members of the General Committee present at the annual meeting. The Government Fields Supervisor for the district shall also be an *ex officio* member of the Executive Committee. In event of vacancy occurring in executive after the annual meeting, executive to fill same.

8. *Meetings of Executive Committee.*—Meetings of the Executive Committee shall be held when required, and shall be called by the chairman, who shall give at least four days' notice to each member.

9. *Chairman.*—The chairman and vice-chairman of the association shall be elected from the Executive Committee by ballot of the General Committee. The chairman shall be *ex officio* chairman of the sub-committees, and shall have a deliberative as well as a casting vote at all meetings.

10. *Duties of General Committee.*—It shall be the duty of the General Committee to receive suggestions from the contributing bodies for the advancement of the objects of the association, to receive reports from the Executive Committee, to give directions to the Executive Committee as to the general lines on which operations are to be carried out, and generally to carry out the work of the association.

11. *Duties of Executive Committee.*—It shall be the duty of the Executive Committee to draw up details of operations to be undertaken, to attend to the finances of the association, the leasing of land, the employment of labour, the purchase and sale of material, produce, and stock, and generally to carry the details of the association's operations; but the actions of the Executive Committee shall at all times be subject to review by the General Committee.

12. *Inspection of Operations.*—Every member of the General Committee shall inspect every plot or experiment of the association at least once in each year, and also on other occasions as far as possible. Members representing counties shall inspect the plots or experiments situated in the counties which they represent at least four times in each year.

13. *Secretary.*—The General Committee shall appoint a secretary, whose duty it shall be to record the minutes, conduct correspondence, give notice of meetings, and keep the accounts.

14. *Bank Account.*—All moneys received shall be paid into a banking account, cheques on which shall be signed by the chairman or vice-chairman and countersigned by the secretary.

15. *Quorum.*—Five shall form a quorum at meetings of the General Committee, and three at meetings of the Executive Committee.

16. *Alterations to Rules.*—Alterations to the rules must be passed by the Executive Committee and confirmed by the General Committee before becoming operative.

ANNUAL SHEEP RETURNS.

THE complete annual sheep returns for 1917, which are summarized in tabulated form on another page, show a total of 25,270,386 sheep for the Dominion. This is an increase of 482,236 as compared with the previous year, and the total is the highest recorded. Breeding-ewes show an increase of 367,402—namely, 244,968 in the North Island and 122,434 in the South Island. An innovation in the returns this year is that the stud sheep returned by owners are only those entered in the respective flock-books. This will explain the apparent decrease of stud sheep as compared with previous years.

CO-OPERATIVE FRUIT-VARIETY TESTING.

LOWER MOUTERE TEST AREA.

W. C. HYDE, Orchard Instructor, Nelson.

THE variety test for fruit-trees dealt with in this report is being carried out in the orchard of Mr. Charles H. MacKay, of Lower Moutere, Nelson District. The orchard is on flat country about two miles from the sea, in the valley of the Moutere River. The valley runs north and south, and at this point is about one mile wide, with low clay hills on either side. The orchard is toward the eastern side of the valley, the soil being a yellow loam on deep clay.

Seven varieties of pear-trees, and twenty-nine varieties of apple-trees (three of each kind), were planted five years ago. During that period the cultivation has been good, the spraying fair, and the pruning attended to in season.

The following notes describe the trees on this experimental area as they stood at the end of last season.

PEARS.

Louise Bonne of Jersey.—These trees have made good growth of neat habit, spurring freely. They have cropped consistently, and came into bearing at an early age—a rather striking contrast to those on the Tasman experimental area, on which hills this variety gave poor results.

Marie Louise.—Have made strong growth with vigorous laterals, and are slow in coming into maturity; they have borne a small crop this season.

Winter Cole.—Now well over 9 ft. in height, and this season—a bad one for pears—have each carried on an average ¾ bushel of fruit of an excellent sample on the vigorous laterals.

Fertility.—In this locality have shown themselves to be strong, shapely growers, spurring freely, and cropping early and heavy.

Conference.—These are now about 6 ft. high, making shapely moderate growth, but have not yet borne any crop.

Doyenne du Comice.—While making good shapely growth and being now 8 ft. high, with the frame of the tree carrying light twiggy laterals; these have so far borne no crop.

Beurre de Capiaumont.—Have made poor growth without any crop so far.

GENERAL REMARKS.—The above-named trees are all clean, and have given little trouble in the way of disease, a slight infection of pear-mite on Doyenne du Comice being the only exception.

APPLES.

Dougherty.—These trees are some 6 ft. in height, of moderate vigour, with a well-furnished frame; showing some woolly aphis; have cropped well.

Granny Smith.—This highly recommended variety from New South Wales has made vigorous growth, carrying fair crops on laterals and spurs; is slightly affected with woolly aphis.

LOWER MOUTERE ORCHARD TEST AREA.

PEAR WINTER COLE. FIVE YEARS.

APPLE YATES. FIVE YEARS.

Claygate Pearmain.—Have a bold open framework, fairly vigorous and well furnished; rather subject to aphis; crops have been moderate but good quality.

Stark.—Fairly vigorous trees, well-furnished laterals; rather subject to aphis; a very fair cropper.

Duke of Clarence.—Clean, rather strong growth, well clothed with fruitful twigs; slightly affected with aphis; has proved itself a good cropper here.

Allington Pippin.—Trees of exceptional vigour, with a shapely frame, bearing fruit-laterals freely; a good cropper; subject to woolly aphis.

Baldwin. -Vigorous trees with strong bold frame, now beginning to furnish out with fruit-spurs; to date the crop has consisted of two or three fruits annually; trees practically clean.

Gravenstein.—Clean, bold trees of usual type; framework well furnished, giving every indication of early crop; a small crop has been gathered annually for the last two years.

Delicious.—Strong, shapely trees, some 9 ft. in height, that continue to merit the high esteem in which they are held; they averaged 1½ bushels of clean fruit during the past season.

Dumelow's Seedling.—Strong trees with broad base, and framework well furnished; badly affected with woolly aphis; a moderate cropper.

Welcome.—Moderately strong, shapely trees; clean, heavy crops of small early apples of little commercial value.

Dillington Beauty.—Vigorous, shapely trees in fruitful condition; badly affected with aphis; a very fair cropper here.

Alfriston.—Have made clean moderate growth, and have been very fruitful. They would no doubt have been better if not allowed to crop so heavily.

Loy.—Fairly vigorous, clean, shapely growth; evidently a spur-bearer; no crop yet.

Stewart's Seedling (*Ballarat Seedling*).—Strong shapely trees; framework well furnished with twigs and spurs; a little aphis showing.

Yates.—Strong broad-based framework, well furnished with fruiting-laterals; practically clean. This variety resembles Dougherty in many respects, and on this plot is brighter and more free of black-spot. Its record here as a cropper is good.

Senator.—Strong vigorous framework, well furnished for fruit; has been a very fair cropper.

Adams Pearmain.—Shapely trees of moderate growth; badly affected with woolly aphis; only a moderate cropper in this locality.

William Anderson.—Trees unusually vigorous, but slow to mature; carried a small crop this season.

Scarlet Pearmain.—Clean, vigorous trees, in excellent condition; 6 ft. in height after pruning; last season bore a good clean crop.

Beauty of Bath.—Trees exceptionally strong, with shapely broad-based framework, well furnished; slightly affected with aphis; last season they bore a good crop of clean fruit.

Ribston Pippin.—This old favourite is represented by strong shapely trees, cropping well, but rather badly affected with woolly aphis.

French Crab (*Winter Greening*).—Spare, poorly furnished trees, badly affected with woolly aphis and mildew.

Ballarat Seedling.—Rather badly affected with woolly aphis; trees otherwise strong, shapely, and well furnished; a bushel case of 3¼ in. fruit to the tree was carried during the past season.

Worcester Pearmain.—Practically clean; bold-shaped trees of moderate vigour. This favourite February apple has made a good record here as a cropper.

NOTE.—Apples Northern Spy, Rome Beauty, Newtown Pippin, and Etowah were regrafted two years ago with Delicious, Shoreland Queen, Statesman, and McIntosh Red respectively.

SOME CONCLUSIONS.

From the foregoing descriptions it will be noted that apples Alfriston, Scarlet Pearmain, Beauty of Bath, Worcester Pearmain, Dougherty, Yates, Senator, Granny Smith, Duke of Clarence, Graven-

LOWER MOUTERE ORCHARD TEST AREA.
APPLE DELICIOUS. FIVE YEARS.

stein, and Delicious are of outstanding merit on this test area. Of the seven varieties of pears, Louise Bonne of Jersey, Winter Cole, and Fertility have proved their worth in this locality, while Doyenne du Comice, Marie Louise, and Conference, being slower to mature, are not yet proved.

STANDARDIZATION OF RULES FOR JUDGING SHOW FRUIT.

J. A. CAMPBELL, Assistant Director, Horticulture Division.

It is quite understood that in all competitive exhibitions, such as agricultural and horticultural shows, the fortune of competitors is largely in the hands of the judge. To some extent this is quite as it should be, as judges are invariably selected on their knowledge and experience in the particular classes they are called upon to adjudicate, and as experts they should be fully competent to arrive at just decisions.

It is also recognized, however, that an expert may, and very often has, very strong and set opinions with reference to his particular line, and when officiating as a judge these opinions, no matter how sound they may be, may, if left unchecked, detrimentally affect his decision. That is to say, any important feature of the display, if not limited by standard rules for judging, may dominate all others, and a decision be given by a judge that is quite contrary to the wishes of the society for which he is acting.

Instances of this have been only too numerous in the past in connection with fruit shows. In fact, the apparent inconsistency or lack of uniformity among fruit judges has been responsible for many enthusiastic exhibitors cooling off and eventually dropping the show business altogether; while many others have resorted to the expedient of making more than one entry to a class when competing under a judge of whom they have had no previous experience.

These remarks are not intended to reflect on the competency of past judges, but upon the system, or lack of system, on which they were working. A judge must carry out his work according to his own ideas, and so long as ideas differ and remain unrestricted by standard rules, so must judgments continue to be inconsistent and otherwise unsatisfactory.

This matter was taken up by the annual conference of the New Zealand Fruitgrowers' Federation, held at Dunedin in May last, and a committee of growers representing the various districts was appointed to go into the matter with a view to submitting a scheme to the Federation's executive for consideration. The report of the committee—on which the writer was invited to act—included

the proposals set out below, which were approved by the executive as a commencement toward a thorough system of standardization. As such, the Federation strongly recommends their adoption by all agricultural and horticultural societies throughout the Dominion.

NEW ZEALAND FRUITGROWERS' FEDERATION (LIMITED) STANDARD RULES FOR JUDGING SHOW FRUITS.

Apples to be divided into two classes, dessert and culinary, but approved dessert varieties may be allowed to compete in the culinary class. Both classes to be divided into two types—commercial and exhibition.

DESSERT APPLES.

Size.—With a margin of $\frac{1}{8}$ in. above and below, the sizes named against the various dessert apples of each class in list below are the standard sizes arranged.

The following is the list of varieties of dessert apples recommended for planting for various purposes by the recent Varieties Conference and standardized by the Federation for show purposes :—

	Exhibition. Inches.	Commercial. Inches.
Beauty of Bath	3½	2⅞
Cleopatra	3¼	2⅝
Cox's Orange Pippin	3¼	2⅝
Delicious	3¼	2⅝
Dougherty	3	2⅝
Dunn's (Munroe's) Favourite	3⅜	3
Golden Pippin	3¼	2⅝
Gravenstein	3¼	2⅝
Jonathan	3¼	2⅝
London Pippin	3⅜	3
Red Astrachan	3⅜	3
Rome Beauty	3⅜	3
Scarlet Pearmain	3	2⅝
Statesman	3¼	2⅝
Sturmer	3¼	2⅝
Worcester Pearmain	3¼	2⅝
Yellow Newtown Pippin	3⅜	2⅝

The following dessert apples are not included in the approved list, and are not recommended for planting :—

	Exhibition. Inches.	Commercial. Inches.
Adams	3⅜	2⅝
Allington	3¼	2⅝
American Golden Russet	3	2⅝
American Horn	3	2⅝
Boston Russet	3¼	2⅝
Brownlee's Russet	3¼	2⅝
Carlton	3¼	2⅝
Charles Ross	3¼	2⅝
Commerce	3	2⅝
Cornish Aromatic	3¼	2⅝
Duke of Clarence	3⅜	3
Democrat	3⅜	3
Esopus Spitzenburg	3⅜	3
Edward Lippiatt	3¼	2⅞
Frimley Beauty	3⅜	3
Gem	3¼	2⅞
Golden Reinette	3¼	2⅞
King David	3⅜	2⅞
King of the Pippin	3¼	2⅝
McLiver's Winesap	3	2⅝
Northern Spy	3⅜	3
Parlin's Beauty	3⅜	3
Pioneer	3⅜	2⅝
Premier	3¼	2⅞
Ribston Pippin	3¼	2⅞
Rokewood	3	2⅝
Salome	3¼	2⅝
Scarlet Queen	3¼	2⅝
Scarlet Nonpareil	3	2⅝
Senator	3¼	2⅝
Stark	3⅜	2⅝
Shepherd's Perfection	3¼	2⅞
Stayman's Winesap	3⅜	3
William Anderson	3	2⅝
Willie Sharp	3¼	2⅝

COOKING-APPLES.

Size.—With a margin of $\frac{1}{4}$ in. above and below the size named for exhibition class, and $\frac{1}{8}$ in. above and below the size named for commercial class of the various cooking-apples, in list below, are the standard sizes arranged.

The following is the list of varieties of cooking-apples recommended for planting by the recent Varieties Conference and standardized by the federation for show purposes :—

	Exhibition. Inches.	Commercial. Inches.
Alfriston	3⅜	3¼
Ballarat	3⅜	3¼
Dunn's (Munroe's) Favourite	3⅜	3¼
London Pippin	3⅜	3¼
Lord Suffield	3⅜	3¼
Lord Wolseley	3⅜	3
Reinette du Canada	3⅜	3¼
Sturmer	3⅜	3⅜

The following cooking-apples, although standardized for show purposes, are not included in the approved list:—

	Exhibition. Inches.	Commercial. Inches.
Blenheim Orange	3½	3
Commerce	3½	3
Dumelow's	3¼	3
Emperor Alexander	3½	3½
French Crab	3¼	3
Gloria Mundi	3½	3½
Hoover	3¼	3
John Bull	3½	3
Mobbs's Royal	3¾	3½
Northern Spy	3½	3½
Parlin's Beauty	3½	3½
Pioneer	3½	3½
Pride of Australia	3½	3
Prince Alfred	3½	3½
Premier	3½	3½
Rhode Island Greening	3½	3
Rokewood	3½	3
Rymer	3½	3
Springdale	3½	3
Stone Pippin	3½	3
Sharpe's Late Red	3½	3½
Washington	3½	3½
Yellow Belle Fleur	3½	3

DIRECTIONS FOR SCORING.

Naming.—Misnaming in plate and single-case entries disqualifies the entry. Collection and case entries will lose two points for each fault.

Size.—The standard size includes the margin of allowance above and below measurement as stated. Measurements within the margin limits will be allotted full points, but, all other score being equal, the determining factor will be the entry measuring nearest the actual centre of standard size arranged. Two points to be sacrificed for every $\frac{1}{16}$ in. above or below the standard limits.

Condition.—In judging for condition consideration is to be given to the purpose of the fruit at time of judging. In explanation: The aim for a plate of dessert apples or pears should be prime condition for dessert purposes when being judged, and points awarded accordingly.

Fruit for local market: The show-bench at time of judging should be treated as the market.

Fruit for export: The condition in which the fruit should arrive at its destination—say, six weeks later.

Staging.—Pleasing effect attained in displaying the fruit.

Market Value.—The popularity of the variety on the New Zealand markets, together with the condition of the fruit exhibited, to be the standard of value for allotting points.

SCORE-CARDS.

Apples, Single Plate Lots—Dessert.

	Points.
Size and uniformity	20
Typical form	10
Flavour and condition	30
Colour	25
Freedom from blemish	15
	100

Condition: Misnaming will disqualify.

Apples, Single Plate Lots—Cooking.

	Points.
Size and uniformity	25
Typical form	10
Condition and cooking-quality	30
Colour	20
Freedom from blemish	15
	100

Condition: Misnaming will disqualify.

Apples, Collection of Plates—Dessert.

Correct naming	5
Size and uniformity	10
Typical form	5
Flavour and condition	25
Colour	20
Market value	20
Freedom from blemish	10
Staging of exhibit	5
	100

Condition: Misnaming will lose two points for each fault.

Apples, Collection of Plates—Cooking.

Correct naming	5
Size and uniformity	15
Typical form and colour	15
Condition and cooking-quality	25
Market value	25
Freedom from blemish	10
Staging of exhibit	5
	100

Condition: Misnaming will lose two points for each fault.

Case Apples.

	Points.
Typical form and size	10
Storage, transportation, and market value	20
Colour, quality, and freedom from blemish	20
Uniformity of grade	20
Correct height	15
Alignment	10
General appearance of packing (label optional)	5
	100

Condition.—Misnaming will lose two points for each fault.

Pears: Plates and Collection.

	Points.
Quality and flavour	20
Typical form	10
Freedom from blemish	15
Market value	20
Colour and condition	20
Uniformity	15
	100

Condition: Misnaming will disqualify.

Pears: Cases.

	Points.
Typical form	10
Storage, transportation, and market value	20
Colour, condition, and quality	20
Uniformity of grade	20
Correct height	15
Alignment	10
General appearance and packing (label optional)	5
	100

Condition: Misnaming will lose two points for each fault.

POISON-IVY AND VIRGINIAN CREEPER.

OWING to various accounts that have appeared in print during the past year or two—statements incomplete rather than inaccurate—many people have been led to think that the Virginian creeper is poison-ivy, and are thus inclined to shun a very desirable climbing plant. The "poison-ivy," "poison-oak," or "poison-tree," as it is variously called, is a species of sumach botanically known as *Rhus toxicodendron*. Some of the species of sumach are prized for autumn-tinted leaves, but they are mostly shrubs. The "smoke-bush" (*Rhus cotinus*) is a very fine garden-plant, its masses of tiny panicled flowers when viewed from a distance having the appearance of smoke. *Rhus toxicodendron* is the only species that is poisonous, and that only in the manner of *Primula obconica*, but probably its poison is more potent than that of the primula. It is well known that some persons cannot handle *Primula obconica* without contracting eczema. The confusion of the plants has been added to by the rhus in question being sometimes sold as *Ampelopsis Hoggii*. The botanical name of the Virginian creeper is *Ampelopsis*, and there are many species. There need not be the least difficulty in deciding whether a plant is an *Ampelopsis* or *Rhus toxicodendron*. The Virginian creeper has leaves that are divided into a number of leaflets; the leaves of the rhus are only thrice divided.—*W. H. Taylor, Horticulturist.*

WORK FOR THE COMING MONTH.

THE ORCHARD.

J. A. CAMPBELL, Assistant Director, Horticulture Division.

THE BLOSSOMING AND SETTING PERIOD.

THE success of the fruit crop is particularly affected by the climatic conditions prevailing during the blossoming-period and immediately subsequent to the setting of the fruit. With pip-fruits the blossoming-period, taken in conjunction with different districts of New Zealand and the various varieties of trees, covers a considerable range. A few varieties of pears come into blossom as early as August, while a number of apples bloom well into November. The actual date of the blossoming of any particular variety of apple or pear may vary several days according to the nature of the season, but the variation of the same variety between districts is often very slight, and at times, contrary to what is generally supposed, varieties in Central Otago, instead of blossoming later, are simultaneous with and in some cases earlier than the same varieties grown in the Auckland District.

In the season of 1913 the Sturmer and Jonathan trees came into bloom as follows: Sturmer—Otago, 27th to 30th September; Nelson, 1st to 4th October; Hastings, 1st to 3rd October; Auckland, 2nd to 4th October. Jonathan—Otago, 25th to 29th September; Nelson, 25th September to 6th October; Hastings, 28th September to 6th October; Auckland, 1st to 9th October. Generally speaking, however, the blossoming-period of the majority of pears extends from 15th September to 25th October, and that of apples from 25th September to the first week in November.

Fine sunny weather is what is hoped for during this period. Not only are such conditions adverse to the development of fungus diseases, but the dispersal of pollen and fertilization of the blossoms is also assured through the diligent labours of the bee. Conditions, however, are not always what we would wish them to be. What the orchardist is concerned in is how to "come out on top" when climatic conditions are much less bright.

PREPARATORY WORK.

Little early preparatory work can be done to ensure the setting of fruit in a wet season other than arranging to have in the vicinity of the orchard an adequate number of bees to ensure the maximum advantage being gained for the work done by these voluntary orchard assistants during the fine days that may occur, and by assisting them in their work—or, rather, by controlling it to the advantage of a more complete fertilization—by reducing where practicable the number of blossoms the tree would otherwise bear. Profuse blossom does not

necessarily mean under any circumstances a corresponding heavy crop of fruit; in fact, the reverse is almost invariably the case. Therefore the pruning-away of surplus blossom-buds not only has the effect of strengthening and making more fertile those that remain, but it also reduces the number of blossoms to be visited by bees, which in a season when suitable working-weather is limited is of no small advantage.

In preparing to meet attacks of fungus diseases and insect pests the orchardist has more scope. The *modus operandi* in each case is governed by circumstances, but the guiding principle throughout should be cleanliness and thoroughness. Cleanliness consists in the complete removal from the orchard or the destruction of all rubbish, &c., likely to harbour disease, particularly coarse bark, old dead leaves, and fruit; also the pruning-away of all dead and diseased wood and the destruction of all prunings. Thoroughness pertains to all seasonal matters, particularly in cultivation, and in the application of reliable spraying-compounds not after but before the particular diseases aimed at become active, also the renewal of such spraying as circumstances demand.

Much of the preparatory work for the coming summer campaign should already have been attended to, one of the most critical periods of the year having already opened There is little doubt that the most effective treatment for the control of black-spot, as far as spraying is concerned, is when the buds show colour, and although a large number of varieties will have already passed this stage of development there are still a number that have not yet done so. In addition to the completion of this spraying there is also the calyx-spraying to attend to.

CALYX-SPRAYING.

Calyx-spraying (or spraying when the fruit has set, as it is generally termed among New Zealand growers) is considered of the utmost importance in many parts of North America. It is there estimated that the codlin-grub enters the eye of the apple in the proportion of 75 per cent. of affected fruits, and the orchardists aim at overcoming this by carrying out what they term the single-spray process. The single spray in this case, however, is really a term applying to the calyx-spraying period, and not to the number of applications required. As a matter of fact two applications are required. The object aimed at is to fill the calyx-cup with a poisonous mixture, the poison to be held in place by the closing of the calyx, thereby forming a toxic trap for the destruction of all grubs that endeavour to enter the fruit at this point.

For applying this method thoroughly a high pressure is needed to force the spray well into the calyx-cups. This, of course, cannot be done after they close, which they do a very short time after the blossoms fall. Therefore, owing to the period over which a tree sets its fruit, at least two applications of the spray are required to make the work effective. The first of these is recommended to be given when two-thirds of the blossoms have fallen, the second when the remainder have fallen.

Although the percentage of infection through the eye of the fruit does not appear to be anything nearly so high in New Zealand as is stated to be the case in America, calyx-spraying is held to be an important feature of our orchard-work. This is not only in connection

with codlin-moth control; at this stage fungus diseases are also liable to be troublesome, rendering spraying for these alone of the utmost importance. Therefore if a combined insecticide and fungicide is used both purposes can be served at the same time. At this stage of growth, however, the tender nature of the skin of the fruit must be taken into consideration, and a spray somewhat weaker than is required for either purpose later in the season should be used.

POWDERY MILDEW.

Of recent years powdery mildew has been increasingly troublesome to many of the weaker varieties of apples. Not only does this disease by affecting the foliage very detrimentally influence the growth and general health of the tree attacked, but it also renders the leaves more liable to spray-scorching, with the result that the tree receives a further check. Such constitutionally weak trees as the Jonathan, when called upon to withstand a bad attack of this kind—particularly when combined with other neglect, such as underpruning, overbearing, &c.—are often rendered quite useless by the time they are ten years old. If taken in hand, however, powdery mildew is not a difficult disease to deal with. An affected tree should be pruned in the winter and otherwise treated so as to encourage growth. All affected growths that escape the winter spraying should be removed as soon as fresh growth commences, when such parts become plainly evident by the white powdery appearance of the foliage. Also, as soon as the buds burst the tree should be sprayed with either lime-sulphur or atomic sulphur at the strengths mentioned further on.

BROWN-ROT.

A good deal has been written recently with reference to this disease (see last month's *Journal*), but it may be well to repeat that a systematic thinning, which is essential in any case to good-quality fruit, will materially lessen the difficulty of keeping the disease in hand, particularly when combined with the careful destruction of all affected fruit at frequent intervals.

SPRAYING AND SPRAYS RECOMMENDED.

Black-spot (colour-bud spray).—Pears: 6-4-50 bordeaux, or 1–20 lime-sulphur. Apples: 3-4-40 bordeaux, or 1–25 to 1–30 lime-sulphur.

Ditto (when fruit has set).—Pears: 2-3-40 bordeaux, or 1–125 lime-sulphur. Apples: 2-3-40 bordeaux, or 1–125 lime-sulphur.

Ditto (subsequent sprayings).—Pears: 3-4-40 bordeaux, or 1–100 lime-sulphur. Apples: North Island, 1–100 to 1–120 lime-sulphur; South Island, 1–120 to 1–130 lime-sulphur.

Codlin-moth.—When fruit has set, paste arsenate of lead, 1 lb. to 50 gallons of water, combined with either bordeaux or lime-sulphur at the above strengths.

Powdery Mildew (colour-bud spray).—Lime-sulphur, 1–25 to 1–30, or atomic sulphur, 10 lb. to 100 gallons water.

Ditto (subsequent sprayings).—Lime-sulphur as for black-spot, combined with arsenate of lead. Atomic sulphur, 8 lb. to 10 lb. to 100 gallons water, with 3 lb. of arsenate of lead added.

Mixing Lime-sulphur and Arsenate of Lead.—When using these sprays in combination it is preferable to mix the ingredients separately, using half the total quantity of water for each and then pouring them simultaneously into a third vessel, as in making bordeaux. Otherwise remove sufficient water from the bulk in which to thoroughly mix the arsenate. Add the lime-sulphur to the bulk of the water, and follow with the arsenate-of-lead mixture. Stir well, and in either case use as soon after mixing as possible.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

BROODER MANAGEMENT.

WHILE there are many different styles of both heated and fireless brooders for rearing artificially hatched chicks, none have yet been discovered to perfectly take the place of the natural mother. This is chiefly because, whatever the weather conditions, the little ones can always enjoy under the hen that absolute uniformity of warmth demanded by them, and at the same time breathe the fresh air so essential to their welfare. While this is true, yet with the up-to-date brooder appliances now available, and the exercise of ordinary common-sense care in their management, the rearing of chicks by artificial means has been made a comparatively simple matter, and they may be made to do practically as well as when raised in the natural way. To be successful in brooding chicks the attendant must largely take the place of the natural mother. He must by study and observation seek to provide conditions resembling the natural method as closely as possible.

In brooder-work the great essential is to prevent the little ones from becoming chilled. Thousands of chicks are lost annually through no other cause. While there are many ways in which chickens become chilled, the most common cause is undoubtedly overheating and insufficient ventilation in the brooder-box. A most common experience in artificial brooding is that the early-hatched chicks do exceptionally well—that is when cold weather is being experienced. On the other hand, as the season advances and the weather gets warmer heavy mortality takes place. In nine out of ten cases the cause of this is mismanagement in neglecting to provide more ventilation to suit the warmer weather conditions. Perhaps the most important fact disclosed by modern study of poultry-keeping is the necessity of fresh air for the birds, and if this is so in regard to adult stock it is even more the case with chickens. In the artificial rearing of chickens the greatest success will never be achieved unless the poultryman can control temperatures and ventilation at all stages of the process. The brooder should be so constructed that extremes of heat and cold may be prevented, while at the same time stuffiness or draughts must never be allowed to exist.

It is surprising how some poultrymen go on year after year losing their chicks and contenting themselves by imagining that some serious epidemic over which they have no control is responsible. In other cases the high death-rate is put down to bad luck. Usually there is no bad luck about it, the sole cause of the trouble being fetid air and too high a temperature in the brooder-box. Overheating and insufficient ventilation induce sweating, and this makes the chicks susceptible to chill immediately they leave the brooder. From this the little ones seldom recover or develop into good stock.

Of course there are other causes of chicks becoming chilled, such as an irregular temperature in the brooder-box, removing them from the incubator before they are properly dry, or giving them too much freedom for the first few days. The most manifest symptoms of chill are bowel troubles, excessive thirst, droopy wings, a distressed chirp, and no inclination to take exercise or to eat. In addition there is always a tendency to huddling. The huddling effort brings about a spreading of the legs, especially where insufficient bedding-material is provided and the floor of the brooder is made of smooth boards. The constant squeezing-in of the chickens in their endeavour to get an inside position, which is naturally the warmest, causes the delicate legs to spread, and there is no cure for this trouble. When chickens begin to die through the effects of chill it is useless trying to doctor them. The cause should be looked for, and removed if possible.

On no account should chickens be overcrowded. It is one of the mistakes which never fail to make trouble, especially where the quarters are not kept in a thoroughly sanitary state. Failure to prevent overcrowding and neglect of strict cleanliness are common causes of vermin making an appearance, and this is one of the things that must be guarded against. Chickens with the natural mother will sometimes do more or less well even when infested with vermin, but when chickens are in the brooder vermin is fatal to them.

Correct feeding is another essential which must not be overlooked. Only good sound grains should be used, while care must be taken as to the manner in which it is supplied. Baby chicks do not require much food for the first few days; in fact, they require nothing for at least twenty-four hours after they are hatched. During the first week especially it is always a good plan to underfeed rather than to overfeed the chicks. They should be fed often, and only what they will eat up clean. If fed at once, or even if overfed during the first week, they will not assimilate the yolk which they absorb just before leaving the shell. Green food is an important matter in the rearing of young stock. It should be supplied in abundance. Care must be taken that it be tender and succulent—not coarse grass or hard fibrous growth. When birds are supplied with long pieces of rank grass the fibrous substances become a tangled mass and will not leave the gizzard, with the result that death takes place. Charcoal is another thing which should not be overlooked. For chicks of all ages it is one of the best preventives for bowel trouble, and also assists digestion. An ample supply of clean water as well as good grit are also imperative if the chicks are to make the best growth.

To sum up: For success in the artificial rearing of young stock correct temperature and proper provision for ventilation and exercise must go hand-in-hand with good feeding and strict regard to cleanliness.

LUCERNE AND CLOVER AS POULTRY-FOODS.

In view of the present scarcity of wheat, pollard, bran, &c., and the future uncertainty as to food-supplies, I cannot too strongly advocate the growing of a patch of lucerne, when possible, by all poultry-keepers. The high value of lucerne as a poultry-food has been clearly demonstrated in the recent tests carried out at the Milton Poultry-station. Poultrymen who have a good patch of lucerne will be in a strong position next year, as a liberal supply of this great fodder will be found the best of all means of reducing the feed-bill. In the first place, there is nothing better for keeping fowls in good condition, and also for promoting egg-production, than an ample supply of chaffed green lucerne fed in the troughs during the day. Again, well-cured lucerne hay, chaffed and steamed overnight, will be found a valuable material for the morning mash, especially in the off season. Further, where the necessary appliances are available it can be ground into meal, and can wholly take the place of pollard. Experience is proving that lucerne can be grown under a great variety of conditions, and that it thrives in locations which at one time were thought to be an impossible habitat for this plant. Certainly great care has to be taken to secure a good clean seed-bed and keep the young plants free from weeds, but when lucerne is well established it can be maintained in a flourishing condition at little cost in the way of labour. A bulletin giving hints on the growing of lucerne will be supplied gratis on application to the Department.

Clover is another valuable food for poultry which is not appreciated by poultry-keepers in the Dominion as it should be. It is a popular food in America, and is fed at all seasons of the year, by egg-farmers in particular. Like lucerne it is an excellent green food and can be fed in large quantities, while in its dry chaff form, if steamed the night before using, it not only adds to the value of the morning mash, but also cheapens its cost and makes it decidedly appetizing.

THE APIARY.

E. A. EARP, Apiary Instructor.

SEASONAL PREPARATION.

OCTOBER is perhaps the month when the apiarist can do most to help his bees to work up to full strength in time for the main honey-flow. In the warmer parts of the country swarms may be looked for about the middle of the month, but in the southern districts they will probably not appear until three or four weeks later. By 1st October, unless the weather for some weeks has been cold and wet every hive should have been examined and its condition noted with regard to stores, population, and health. No colony should be allowed to dwindle because it has not sufficient food to provide for the offspring of a prolific queen. Yet, on the other hand, some beekeepers prefer that all the old honey in the hive should be used up before the new

season's flow commences. The food-supply of the hive is sometimes an exceedingly puzzling matter, as it varies considerably in accordance with the weather and the strength of the colony, and only periodical and systematic examinations can settle the question as to whether all is well with the hives in this respect. No harm can be done by feeding good white-sugar syrup, but a hive which is starved in the spring will probably not recover its strength till the main honey-flow is nearly over. By the middle of October, under normal weather conditions, every hive should have at least four frames of sealed brood, and many will have more. Those that have fewer, unless their food-supply is very short, should be marked for requeening as soon as possible. The apiarist's endeavour should be to keep his colonies as even as possible, thereby obtaining a uniform surplus throughout the apiary.

Wherever there is a fair yield of nectar from spring flowers the beekeeper would do well to take advantage of the warm days of the month to treat any cases of disease which he may have noted earlier in the spring. However, no hard-and-fast rule can be laid down in this matter, everything depending on locality and weather conditions. In some districts it would be almost suicidal for the beekeeper to treat his bees in October; in others, where right conditions prevail, it may be carried out with ease and safety, and the bees brought into good condition by the time a surplus may be expected. Wherever treatment has been undertaken the colonies should be watched in order to see that there is no danger of starvation, and where the spring flow is not considered heavy enough it should be supplemented by liberal feeding.

HIVING SWARMS.

In most text-books on beekeeping this kind of advice is given: "When a swarm settles into a cluster take a light box and shake the bees into it," &c. This advice is all right where the bees are accommodating enough to settle into a convenient position for the shaking process to be carried out. Unfortunately, in many cases bees get into positions whence it is impossible to dislodge them so easily. Sometimes they will settle on a small bush, and much of the cluster will be on the ground. In this case probably the best thing to do is to place the box over the cluster, and if the bees do not show much disposition to climb up into the box they may be persuaded to do so by the use of a little smoke. When they cluster in the centre of a prickly hedge the box should be placed on one side of the hedge and the beekeeper should puff smoke from the other side of the hedge, and thereby drive the bees towards the box. In the event of the swarm taking possession of a fencing-post and clustering on it from top to bottom, as they occasionally do, the smoker must again be used, and in addition it is as well to brush the bees from each side of the post in turn into the swarm-box, with the brush which is used for the frames at extracting-time.

The usual practice is to leave the box sheltered from the sun and covered with a sack near the place where the swarm has settled. Where few hives are kept this may be done with impunity, but if other swarms are expected it is well to remove the box to the place where the colony is to stand permanently, otherwise before the close of the day the probabilities are very largely in favour of the box being taken possession

of by three or four other swarms—a matter of annoyance to the man who wishes to keep his swarms separate.

In every case a swarm should be attended to as soon as it settles. Many people are under the impression that swarms should be left undisturbed till nightfall, but this idea is an erroneous one. They should invariably be placed in the box as soon as possible after the cluster is formed, and put so that they are sheltered from the rays of the sun.

WATER-SUPPLY.

One of the most important of the minor details of apiculture is the provision of a constant water-supply for the purpose of assisting the bees in brood-rearing. Not only is it necessary to conserve the energy of the bees by having the water close at hand, but it is well to ensure that they do not prove a nuisance at taps, cattle-troughs, &c. From early spring till late autumn water is an absolute necessity to bees, and they will consume comparatively immense quantities in fine weather. It thus behoves the beekeeper to see that a liberal supply is always available. By establishing his drinking-fountain early in the season he will teach the bees where to go for supplies, and ensure their always seeking the same spot for water.

WHEN TO START AN APIARY.

One of the questions most frequently asked by the would-be bee-keeper is, "When should I start beekeeping?" Probably no time is better than when the bees are swarming. If the beginner procures a good prime swarm, leaves it in a clean box for three days, and then hives it in a new hive, on new frames, with full sheets of foundation, he has made the best start it is possible to make in beekeeping. The leaving of the swarm in a box for three days is purely a preliminary measure in case there is any disease in the apiary from which the swarm is procured. By the end of three days the bees will have consumed the honey they brought from their old home, and at the same time have disposed of the foul-brood germs (which are innocuous to the adult bee), and be ready and willing to be transferred to their permanent home to start brood-rearing in earnest.

As the bees will have become used to their box by the end of three days, it is as well to carry out the transfer with care. It should be done at sundown on the third day. The hive should be placed in position, a clean sack spread over the alighting-board and surrounding ground, and the hive-body raised from the bottom-board about an inch or so by means of a stone or piece of wood. The box should be firmly grasped with both hands, inverted over the sack as near the hive as possible, and the bees dumped with a brisk movement on to the alighting-board. One shake will dislodge the greater part of the cluster, and the few remaining bees can easily be shaken out and the box taken away. Be sure the queen is out of the swarm-box, and the bees will crawl in a steady stream into the entrance—their progress becoming more rapid as soon as the queen has entered the hive. When the queen is safely inside, the hive body should be lowered and the entrance slightly contracted.

It is advisable to place a feeder inside the hive. Even if the weather is good and a fair supply of nectar available a few pints of

good warm syrup fed for a day or two after hiving will work magic with the new colony, and enable it to build up in time to yield a surplus when the main flow sets in.

The beginner should always start in the spring, and on no account should he attempt to commence with established colonies unless they are purchased from a breeder who guarantees his bees to be clean. Old hives are too apt to be homes of disease, and are only fit to be handled by the experienced apiarist.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

WORK for October includes sowing peas, broad beans, turnip, red beet, French and butter beans, and runner beans. Parsnips may be sown, but if an earlier lot was put in it would be best to hold the main sowing a little longer. If the winter crop of parsnips is sown too early the roots become large and coarse. Medium-sized and tender roots are best, and these can be secured by sowing early in November. Spinach may be sown between rows of newly sown peas; it will be out of the way before the peas require the space. Radish may be similarly sown; in this way these crops are secured with a minimum of labour. Leek, cauliflower, broccoli, brussels sprouts, celery, &c., advised in the last issue of the *Journal* for sowing about the middle of September, should be put in at once if the work has not already been done. Tomatoes may be planted in early places, but it will be too soon for most parts.

Celery.

The main crop of celery should be provided for by sowing seed at once. I am aware that some growers sow later, but it is done more as a matter of expediency than because it is good practice. In the warmer districts celery-growing is attended with some difficulties; hot weather is not to the liking of this plant, and it refuses to grow in dry soil. These facts being known is the reason why sowing in some cases is left till too late. Celery requires a long period of growth; it makes its best growth after what is termed "the turn of the days"—that is, when the hours of daylight begin to shorten, and when conditions become cooler and more moist. A considerable amount of development must, however, be secured before that time, for the plants will not make substantial growth after the days become short unless a certain stage is reached before that time. Given this condition they will make good winter growth. In hot places it will be useless to attempt to grow celery unless there is an ample water-supply. The seed should be sown at the time stated, the young plants being pricked out in shallow boxes, one-third filled with half-decayed stable manure. Frames with shaded glass will suit the plants till they are ready to stand outside, and they should be sprinkled with water morning and evening. If kept regularly moist at root, and spraying is properly

attended to, there should be no trouble with red mites or plant-lice, and proper ventilation will usually prevent attacks of rust. When placed outside, the boxes of plants should not be in a windy situation, which would tend to dry the soil too quickly, and they must be kept well supplied with water. The plants will stand several months in the boxes, and will strengthen if well attended to. The plants should be put out in the trenches early in February, and when planted should be thoroughly watered. In cooler places there is comparatively little trouble, and planting can be done at any time as the plants become ready; but the last lot should be out early in January, the plants being from the September sowing. Later-sown plants may fill a gap, but do not develop large-sized heads.

Insect Pests.

A number of specimens of celery received show that in some parts there is trouble with "celery-rust" and small green lice. Celery-rust may be recognized by small rust-coloured spots on the leaves. As soon as it is detected the affected leaves should be cut off and destroyed, and the plants at once sprayed with bordeaux, 2-2-40 strength, or its equivalent of a proprietary mixture. The means of control are preventive; a bad attack cannot be cured. Plant-lice and aphides can be readily destroyed by spraying with Vistolene or X.L. All fluid.

Young carrots and parsnips, particularly carrots, are liable in warm climates to be attacked by plant-lice. They may not be detected for a time, being very small, but before long the plants look yellowish and the foliage droops. Treat as advised for celery, and the plants soon resume a normal appearance and growth.

During dry summers the larvæ of the diamond-backed moth, commonly known as "cabbage-fly," make the cultivation of cabbages and all the brassica family very difficult. The caterpillars eat the leaves of the plants, and as growth is poor owing to dryness of soil the plants are unable to make headway. The moth is always present, but in wet seasons it does not propagate in great numbers, and as plants grow well in a wet summer they are able to outgrow the damage done by the caterpillars. It is evident that remedial measures must be in the direction of making the plants grow. The caterpillars can be destroyed by spraying with arsenate of lead, but it is quite useless to kill the insects unless the plants can be made to grow, and spraying with arsenate of lead does some injury to the plants. Where water is abundant there is no reason for failing to grow the crops. Tar-water as a deterrent has long proved effectual, but its application must be before the moths appear. The smell of tar is obnoxious to the moths, and they will not alight to lay their eggs on plants treated with it. Quassia-water is used in England in the same way—it is said, with good results. Now we have Vaporite, that promises to be a great boon, as it kills insects in the soil or that inhale its vapour. The most vital parts of the plants are the young leaves just unfolding in the centre. A little hellebore powder dusted occasionally into these hearts will save the plants by killing the caterpillars. Nitrate of soda plays an important part in fighting these pests because of the magical effect it has on growth, and during a dry season it is especially beneficial. When the plants appear to require a filip give a dressing of the nitrate; 1 oz. to the square yard is not too much in a dry season. Apply twice with an interval of three or four weeks between.

SMALL FRUITS.

Gooseberry-mildew.—Judging by inquiries made, it appears that some form of gooseberry-mildew is giving trouble in the garden. There are two distinct species of mildew that attack these plants, the American mildew (*Sphaerotheca mors-uvae*) and *Microsphaera grossulariae*. The latter is most likely the form existing in this country, although I have no authority to say the former does not exist in New Zealand. In any case it perhaps does not matter, as the treatment for both is the same. The leaves and sometimes the fruit and young shoots are attacked. The infection is recognized by whitish mealy patches—to use Mr. T. W. Kirk's expression in Gardeners' Leaflet No. 34—giving the bushes an appearance as if splashed with whitewash. The American mildew is very destructive; the other is not so regarded, but it should be destroyed, especially as the infection may be the more destructive form. The following is the remedy advised by Massee: In spring, when the leaf-buds begin to open, spray with a solution of potassium sulphide (liver of sulphur), 1 lb. in 48 gallons of water; afterwards, when the leaves have expanded, spray again at increased strength, 1 lb. in 32 gallons. Winter treatment, while the bushes are dormant, is to drench thoroughly with full-strength bordeaux.

IMPORTATIONS OF FRESH FRUIT.

THE following table shows the varieties and quantities of fresh fruits imported into New Zealand at the different ports of inspection during the year ended 31st March, 1917. The figures represent cases.

Port of Inspection.	Apples.	Pears.	Loquats.	Grapes.	Plums.	Cherries.
Auckland ..	41,954	828	378	..	10	55
Wellington ..	21,518	..	201	115	..	497
Christchurch ..	4,885	50	106	54	45	..
Dunedin ..	8,543	..	59	114	..	..
Bluff	2,937	..	..	..	..	..
Totals ..	79,837	878	744	283	55	552

Port of Inspection.	Oranges.	Mandarins.	Lemons.	Pines.	Passions.	Bananas.
Auckland ..	73,344	4,062	828	6,618	2,045	240,410
Wellington ..	64,268	14,149	8,355	6,120	5,495	29,723
Christchurch ..	20,645	2,935	3,003	1,900	1,561	25,157
Dunedin ..	14,020	2,406	2,097	1,420	1,229	17,111
Bluff	2,397	675	572	438	387	2,238
Totals ..	174,674	24,227	14,855	16,495	10,717	314,639

The totals of all varieties imported at the several ports are as follows: Auckland, 370,532; Wellington, 150,441; Christchurch, 60,341; Dunedin, 46,999; and Bluff, 9,644 cases. The grand total for the Dominion is 637,957 cases, as against 559,619 cases in the previous twelve months.

ANSWERS TO CORRESPONDENTS.

IN every instance a question to which an answer is desired in the *Journal* must be accompanied by the full name and the postal address of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written on one side of the paper only.

CATERPILLARS IN OATS.

G. H. BRADLEY, Arapohue:—

Kindly advise me whether there is any preventive of caterpillars in oats. Last year most of us farmers on the Northern Wairoa were heavy losers in the oat crops owing to these insects.

The Biologist:—

The commonest species of moth that in the larval or caterpillar stage damages oats and other cereal crops is the native army-worm (*Melanchra composita*). This insect was extremely destructive last season in many parts of New Zealand. Late-maturing crops are almost always more seriously damaged than early-ripening ones. In districts where caterpillar is bad an effort should be made to have the oat crops ready for harvesting as near to Christmas or the New Year as possible. In certain cases an extensive brood of caterpillars may be on the move even before Christmas, and under such circumstances the crops should be protected if possible. The only satisfactory method is to sacrifice a headland of about 15 yards right round the crop, spraying it with arsenate of lead, 2 lb. to 40 gallons water, as soon as there is any sign of caterpillars. If heavy rain occurs after spraying and before harvesting the sprayed portion may be safe to chaff, and if when spraying takes place the crop is not in full ear the sprayed portion can be used for grain, but care might have to be taken in the using of the straw. The throwing-up of a furrow or the digging of a trench round the crop, smearing the steep edge with tar, is often suggested, and at times will turn the caterpillars from a crop, but this method is not always satisfactory. If a crop is attacked just on harvesting-time it should be cut instantly, as a cut crop never suffers to the same extent as a standing one. Direct methods of control are, however, often quite impossible to carry out, as the attacks are generally extremely sudden and no warning is given. It would certainly be best to try and have your oats maturing as early as possible, and also not allow any rank growth during the previous summer in the paddocks near those that are to be devoted to cereal-growing. This is most important, as the moth for preference lays its eggs on areas which are not well fed down.

FOOT-ROT IN COWS.

"DAIRYMAN," Little River:—

During the past season I had several cases of foot-rot in my dairy herd. In appearance it was the same as foot-rot in sheep, and smelled the same. The first signs were severe lameness, then swelling and heat, then discharge from between the toes. I tried treatment with bluestone solution, and also used butter of antimony, but without much success. I would be glad of any information as to prevention and treatment.

The Live-stock Division:—

Ointments of any sort are not so efficient in cases of foot trouble as solutions, as ointments do not penetrate to the root of the disease. We would recommend that you have a wooden foot-bath made and fixed to the floor of a bail. Into this put sheep-dip of the ordinary strength, and then bail up the affected animal, and allow her to stand there at least ten minutes every other day.

GROWTH ON HORSE'S FETLOCK.

P. RUSHTON, Tatuanui:—

I have a six-year-old draught gelding with a growth on the inside of the hind fetlock. The growth resembles a wart, and is a little larger than a pigeon's egg. The animal brushes it badly when working. The growth has been forming for six months or more. Will you kindly advise as to treatment?

The Live-stock Division:—

The animal should be put out of work for a few months. The growth you refer to had much better be cut off before any treatment is adopted. This will save considerable time; to reduce the growth by caustics would entail a considerable amount of work and time. After removal a dressing with corrosive sublimate, chloride of zinc, or bluestone should be applied. These can be procured from any chemist. Care must be exercised, however, to protect the surrounding healthy parts by using soap or other material to rub all round the part where the caustic is to be applied.

FERMENTING OF HONEY.

"E. H.," Hamilton:—

Please inform me as to the cause of extracted honey fermenting, and how to treat this class of honey to prevent it fermenting.

The Horticulture Division:—

The cause of extracted honey fermenting may be attributed to the honey being extracted before the cells are all capped over, thus mixing the green honey, which contains a large percentage of water, with the ripe honey which is always capped over. This would raise the water-content to a high percentage, the eventual result being that the honey would ferment. Supposing the honey was ripe when extracted it would rapidly deteriorate and eventually ferment if left exposed to a damp atmosphere, as honey will absorb moisture. All honey should be kept sealed and stored in a dry atmosphere.

PREPARING BONE AND CHARCOAL FOR POULTRY.

"SUBSCRIBER," Waitaki South:—

Kindly let me know the best method of drying green bone for cracking for fowls; also the best way to make charcoal. Would gorse wood make good charcoal?

The Live-stock Division:—

To dry green bone it would have to first pass through a retort, which would be impracticable on the ordinary poultry plant. We would recommend you to secure a green-bone cutter. Gorse wood could be used for making charcoal, but willow wood would be preferable for this purpose.

FORAGE CROPS FOR WET SEASON.

W. H. C., Onerahi:—

Owing to the excessive rain in this district cropping has been at a standstill. I intended putting in Algerian oats, but thought perhaps rye-corn or barley might be quicker and stand the wet better. My plots are small and of very good quality—foothill and creek formation—most of which has been worked for two years. I should be glad of advice as to forage crops.

The Fields Division:—

For rapid growth brown and black skinless barley are best, but all the barleys are the most susceptible of the cereals to wet, unfavourable conditions. Rye-corn is hardy, but takes some time to get over the stooling-stage. Algerian oats frequently redden off under wet conditions. A mixture of rye-corn and

wheat (John Brown or Solid-straw Tuscan), 1 bushel of each, would perhaps be the most suitable of the cereals. In your position we should be inclined to favour 1½ bushels of Italian rye-grass, with the addition of 6 lb. of red clover, if seeding conditions are good.

FORAGE CROPS FOR COWS.

A. T. H., Methven:—

I drilled swedes on an acre and a half last year, and the growth was smothered by yarr. What would you advise me to put in this year for green feed for cows, to be ready about the end of December; also, what would be best to follow for winter feed? This is fairly good ground, but has a shingly patch at one end.

The Fields Division:—

The Canterbury climate is not favourable for the production of heavy green forage in December. The best thing we can suggest is tares (preferably Golden), sown at the rate of 1½ bushels per acre, with 1 bushel of oats, at the end of September or beginning of October. As winter feed for cows in your district nothing is as certain as a crop of mangels well cultivated. These, of course, are out of the question if you must use the piece of land you intend for summer feed. In these circumstances we would suggest 1½ bushels per acre of Italian rye-grass. Sown as early as possible in March, this would provide good grazing during July and onwards.

REARING A BULL CALF.

MAYMAN BROS., Albany:—

We are rearing a two-months-old bull calf with the linseed porridge recommended in Bulletin 60: "Calf-rearing" (7 parts ground linseed to 1 maize-meal). We are giving it 3 quarts of fresh milk and about ¾ lb. of the mixture boiled into porridge daily. Will this be sufficient to make a good bull out of him, or should we give any extra food? Is it any advantage to boil the ground linseed?

The Live-stock Division:—

At the bull's age the food is quite all right. This diet, however, would not be good to rear the animal upon right through, and after it is three months old and until, say, seven months, you could add ¼ lb. of linseed-cake (if procurable) and ¼ lb. of crushed oats daily, both to be given dry. From then on the calf would be better weaned and given 1 lb. of linseed-cake and ½ lb. of crushed oats daily in addition to its grass or roots and hay. Be always careful that the animal is not pampered, and that he is allowed reasonable exercise and kept physically fit. Boiling the ground linseed certainly does not do any harm, but it is quite right when scalded.

LUCERNE-MEAL FOR POULTRY AND PIGS.

A. HUTCHINSON, Silverdale:—

Kindly give particulars in regard to the lucerne-meal you refer to on page 38 of the July *Journal* as suitable for egg-production, and how to prepare it. Also, would this meal be suitable to take the place of pollard for feeding pigs?

The Live-stock Division:—

The sample of lucerne referred to was prepared by finely chaffing the hay and then grinding it into meal by means of a No. 3 Wilson farm mill. This machine is especially made for grinding grains and grit, and though adjusted for the Department's purpose would not be suitable for making lucerne-meal commercially. The most important factor in making good lucerne-meal is to cut the growing lucerne at the right period—which is just as it commences to flower—and then to cure the hay properly, ensuring that the leaves do not drop off the stalks. Experience has shown lucerne-meal to be a very valuable food for pigs, and there is no doubt that it could largely take the place of pollard for such purpose.

GOVERNMENT PURCHASE OF 1917–18 WHEAT CROP.

THE Government scheme for the purchase of the wheat crop of the ensuing season has been inaugurated by regulations, gazetted on 10th September, prohibiting, except under permit of the Board of Trade, all private purchases of such wheat. Nothing in the regulations, however, will apply to any retail purchase in a quantity not exceeding 50 bushels.

Accompanying the regulations is an announcement by the Minister of Agriculture notifying that the New Zealand Government is prepared to purchase in any quantities wheat grown in New Zealand during the season 1917–18, at the price of 5s. 10d. per bushel delivered free on board in sacks at the nearest port; or where delivery is made with the consent or by direction of the Government otherwise than free on board at the nearest port, then at a price equivalent as regards the seller to 5s. 10d. free on board at the nearest port. "Nearest port" means the port of entry under the Customs Act, 1913, nearest to the place at which the wheat is grown. No wheat will be so purchased by the Government unless it is good milling-wheat in good and merchantable order and condition.

REGISTRATION OF APIARIES.

ALL beekeepers who have not already done so should realize that it is incumbent upon them to promptly register their apiaries, as prescribed by the recently gazetted regulations, which have been notified in the public Press, and were published on page 51 of the July *Journal*. Under the regulations "beekeeper" means any person who keeps bees or allows the same to be kept on any land occupied by him, or who has in his possession or allows to be kept on any land occupied by him any appliances that have been used in connection with apiculture. Likewise, "apiary" means any place where bees are kept.

Although the time prescribed to which registrations would be received expired on 15th August, the Department, in view of the fact that a complete record of all beekeepers is urgently required, will before taking action allow a reasonable extension of time for voluntary applications for registration to be made. Should, however, the Apiary Instructors of the Department in the course of their duty locate an apiary for the registration of which no definite steps have been taken, proceedings under the regulations will in all probability be instituted against the owner.

Forms of application are obtainable from the District Agents of the Department at Auckland, Napier, Wanganui, Christchurch, Dunedin, and Invercargill; or from the Director of the Horticulture Division, Wellington; or from any of the larger post-offices throughout the Dominion.

REGISTRATION OF ORCHARDS.

THE regulations as to the registration of orchards made in October last year have been revoked, and other regulations made in lieu of them. The new regulations, which were gazetted on 6th September, provide that every occupier of an orchard from which fruit is sold or is intended to be sold shall, in September in each year, make application for the registration of such orchard. Every occupier of an orchard from which fruit is neither sold nor intended to be sold shall in September, 1919, and in each third year thereafter, make application for the registration of such orchard, and shall certify that no fruit has been sold from such orchard, while occupied by him, during the three years ended 31st August preceding. The new regulations do not apply to such orchards as are nurseries, as defined in the regulations gazetted on 22nd June, 1916. Forms of application are obtainable from the Director of the Horticulture Division or from any District Agent or Orchard Instructor of the Department of Agriculture. Registration is free of charge.

ANNUAL SHEEP RETURNS.—SUMMARY OF COMPLETE FIGURES.

SUMMARY BY SHEEP DISTRICTS AT 30TH APRIL, 1917.

—	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago (including Southland).	Total in Dominion.
Stud rams	686	1,367	3,032	344	2,105	2,930	10,464
Other rams	24,359	86,136	72,356	16,349	64,777	54,799	318,766
Wethers	314,700	793,702	855,114	185,957	589,856	718,495	3,457,824
Breeding-ewes	1,053,090	3,403,259	3,019,069	716,338	2,743,370	2,325,043	13,260,169
Dry ewes	57,976	332,530	227,059	46,025	190,368	218,689	1,072,647
Lambs	532,699	2,115,889	1,674,105	399,456	1,127,560	1,300,807	7,150,516
Totals, 1917	1,983,510	6,732,883	5,850,735	1,364,469	4,718,026	4,620,763	25,270,386
Totals, 1916	1,841,086	6,007,480	6,032,233	1,363,478	4,769,989	4,773,884	24,788,150

SHEEP IN THE DOMINION: TEN YEARS, 1908–17.

Year (30th April).	Stud and Flock Rams.	Stud Breeding-ewes.	Stud Dry Ewes.	Stud Lambs.	Total Stud Sheep and Flock Rams.	Flock Sheep, and Sheep of Distinctive Breeds not entered in Flock-books.				Grand Total, Stud and other Sheep.
						Wethers.	Breeding-ewes.	Dry Ewes.	Lambs.	
1908	272,752	230,075	14,725	157,556	675,108	3,378,398	11,013,966	1,152,120	6,229,461	22,449,053
1909	298,918	222,799	14,192	153,948	689,857	3,427,994	12,147,547	1,001,067	6,214,242	23,480,707
1910	305,569	227,187	13,943	160,234	706,933	3,167,082	12,288,193	1,194,570	6,912,842	24,269,620
1911	297,898	229,709	14,117	163,899	705,617	3,342,281	12,094,754	1,298,343	6,555,125	23,996,126
1912	306,588	232,782	11,563	155,498	706,431	3,359,969	12,044,247	1,324,200	6,315,306	23,750,153
1913	313,690	228,145	12,902	167,605	722,342	3,207,550	12,292,891	1,150,805	6,818,222	24,191,810
1914	321,869	229,055	13,526	170,169	734,619	3,211,661	12,691,121	1,152,749	7,008,613	24,798,763
1915	315,251	237,717	17,341	176,556	746,865	3,270,221	12,377,624	1,365,119	7,141,592	24,901,421
1916	316,131	252,201	15,012	175,155	758,499	3,478,263	12,640,566	1,189,023	6,721,799	24,788,150
1917	329,230	160,212	6,212	114,778	610,432	3,457,824	13,099,957	1,066,435	7,035,738	25,270,386

NOTE.—Stud sheep returned for 1917 are only those entered in flock-books.

In the Waikato.